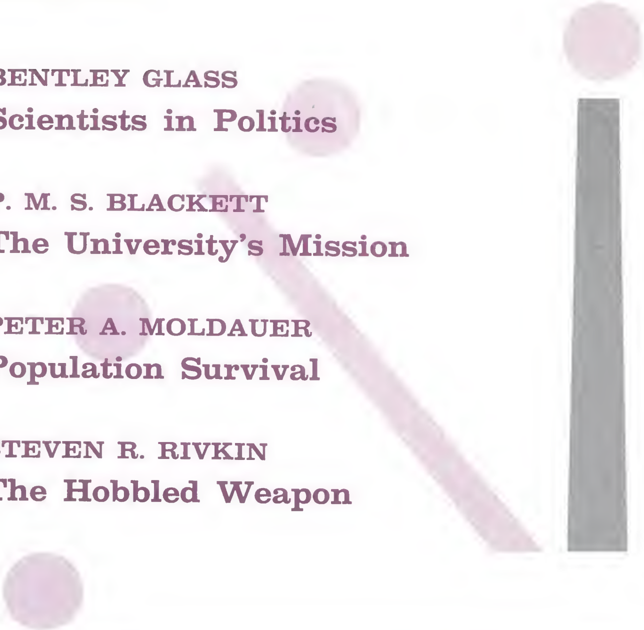
BULLETIN of the ATOMIC SCIENTISTS

THE MAGAZINE OF
SCIENCE AND PUBLIC AFFAIRS

MAY 1962
seventy-five cents



BENTLEY GLASS

Scientists in Politics

P. M. S. BLACKETT

The University's Mission

PETER A. MOLDAUER

Population Survival

STEVEN R. RIVKIN

The Hobbled Weapon

Copyrighted material

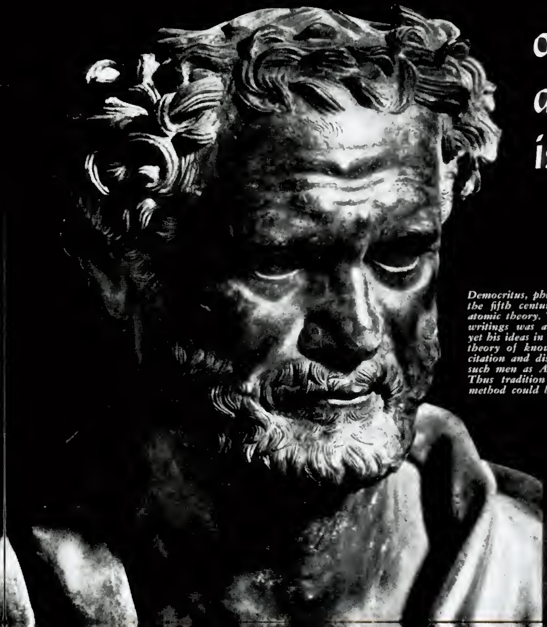
"He claimed there were countless universes of varying magnitude and that some had neither sun nor moon, while in others these were greater than ours, and in others more in number; that distances between the universes varied, some more, some less, and that they expanded, to flourish and to perish. Here was one born, and there snuffed out—destroyed in mutual collision.

"And some of these worlds were desert, he said, devoid of plant and animal life and of all water.

"He claimed the earth in our universe became before the stars, that the moon was down, and next the sun, and then the fixed stars. Nor were the wandering planets of equal height.

"And he said the universe expanded until no longer could it embrace anything from beyond.

"This man used to laugh at everything, as though all among men was worthy of laughter." — from Hippolytus, Ta Philosophumena



Democritus, philosopher and scientist of the fifth century B.C. Founder of the atomic theory. The disappearance of his writings was a serious loss to science, yet his ideas in mathematics, physics and theory of knowledge survived through citation and discussion in the works of such men as Archimedes and Aristotle. Thus tradition carried insight until a method could be found.

EMBOSOGRAF COMPANY
OF ILLINOIS
Chicago 14, Illinois

Bulletin of the Atomic Scientists

The Magazine of Science and Public Affairs

Eugene Rabinowitch
Editor
Ruth Adams
Associate Editor
Helen C. Allison
Contributing Editor
Martyl
Art Editor
Lois Gardner
Paula Fozzy
Assistant Editors
Howard M. Levin
Business Manager
Annaliesa Hanebrink
Exchange Fellow
1961–62, Austria
EDITORIAL BOARD:
Morton Grodzins
David Inglis
Alexander Langsdorf, Jr.
Aaron Novick
Edward Shils
Cyril S. Smith
H. Burr Steinbach
BOARD OF DIRECTORS
Samuel K. Allison
Peter Axel
Morton Grodzins
Alexander Langsdorf, Jr.
Donald H. Miller, Jr.
Eugene Rabinowitch
Hans Zeisel
Walter J. Blum, *Legal Counsel*
BOARD OF SPONSORS:
Hans A. Bethe, *Chairman*
Lee A. Dubridge, *Vice-Chairman*
Samuel K. Allison
Robert F. Bacher
Detlev W. Bronk
A. H. Compton
(1892–1962)
E. U. Condon
F. Daniels
Albert Einstein
(1879–1955)
James Franck
S. A. Goudsmit
T. R. Hogness
F. W. Loomis
Philip M. Morse
H. J. Muller
J. Robert Oppenheimer
Linus Pauling
G. B. Pegram
(1876–1958)
I. I. Rabi
Julian Schwinger
Frederick Seitz
John A. Simpson
Cyril S. Smith
Leo Szilard
Edward Teller
Harold C. Urey
V. F. Weisskopf
Hugh C. Wolfe
Sewall Wright
J. R. Zacharias

Founded in 1945 by Hyman H. Goldsmith and Eugene Rabinowitch

Volume XVIII **May 1962** **Number 5**

Scientists in Politics . . . . *Bentley Glass* 2
The Hobbled Weapon . . . . *Steven R. Rivkin* 8
The University's Mission . . . . *P. M. S. Blackett* 14
Population Survival . . . . *Peter A. Moldauer* 19
Heroes of Our Time 25
The Politics of the Nervous System 26
Psychopathology of Nuclear War . . . . *Donald N. Michael* 28
Freedom for Science . . . . *Leopold Infeld* 31
Disarmament in Middle Europe . . . . *Gerd Burkhardt* 32
Scientist as Citizen 34

Book Reviews

For the Military Bookshelf . . . . *Louis Morton* 36
Toward World Rule of Law . . . . *Kenneth W. Dam* 38
Batchelder: *The Irreversible Decision* . . . . *Laura Fermi* 38
Barth: *The Price of Liberty* . . . . *Harry Kalven, Jr.* 39
Dupre and Lakoff: *Science and the Nation* . . . . *Richard Lewis* 39

Letters to the Editor 40

News and Reports

Tristram Coffin Comments 42
New Scientific Consultant Policy 43
Space Cooperation 45
News 46
Authors 48

Bulletin of the Atomic Scientists. Published monthly (except July and August). Second class postage paid at Chicago, Ill. Copyright 1962 by the Educational Foundation for Nuclear Science, Inc., 935 E. 60th St., Chicago 37, Ill.

Editorial and advertising correspondence should be addressed to Bulletin of the Atomic Scientists, 935 E. 60th St., Chicago 37, Ill. Manuscripts (in duplicate) should be accompanied by addressed envelope and return postage.

Subscription correspondence should be addressed to Bulletin of the Atomic Scientists, Circulation Department, 434 S. Wabash, Chicago 5, Ill. Please allow 5 weeks for change of address. Include your old address as well as your new address. If possible, an address label from a recent issue should be returned.

Subscription rates for U.S.A.: 1 year, $6.00; 2 years, $11.00; 3 years, $15.00. Canada and Pan American Postal Union: 1 year, $6.50; 2 years, $12.00; 3 years, $16.50. All other countries: 1 year, $7.00; 2 years, $13.00; 3 years, $17.50.

This One
PGW1-LRY-JATX

Scientists in Politics

BENTLEY GLASS

IT WOULD BE MISLEADING to suppose that scientists have not always, insofar as we have a historical record, been concerned to some extent about political life. So to assume would be to regard the ivory tower of scientific or academic life as far more secluded than it has ever really been. Modern science, from its beginnings toward the end of the sixteenth century, became immediately concerned with a major political issue, the freedom of the scientist to pursue the truth wherever it might lead him, even though the conclusion might be highly disturbing to settled religious beliefs or social conventions and practice. The ordeal of Galileo leads in spirit directly to the attacks on Charles Darwin 250 years later and to latter-day instances of the social suppression of scientific findings. Today Mendelian genetics in the USSR and the nutritive qualities of oleomargarine in Wisconsin share a similar fate.

Yet for the most part, and with a few notable exceptions, scientists have not entered into organized political life until quite recent times. The years of the great depression in the 1930s brought an extensive reconsideration of the relation of science and the scientist to government, society, and politics. Strongly divergent views continued to be expressed. On the one hand, there is the strongly expressed opinion of the eminent physiologist A. V. Hill, in 1933:

> Not meddling with morals or politics: such, I would urge, is the normal condition of tolerance and immunity for scientific pursuits in a civilized state. I speak not with contempt of these—indeed, the scorn with which some superior people talk of such necessities of social existence as morals and politics seems to me intolerably childish and stupid. The best intellects and characters, not the worst, are wanted for the moral teachers and political governors of mankind: but science should remain aloof and detached, not from any sense of superiority, not from any indifference to the common welfare, but as a condition of complete intellectual honesty. Emotion, entirely necessary in ordinary life, is utterly out of place in making scientific decisions. If science loses its intellectual honesty and its political independence, if —under communism or fascism—it becomes tied to emotion, to propaganda, to advertisement, to particular social or economic theories, it will cease altogether to have its general appeal, and its political immunity will be lost. If science is to continue to make progress, it must insist on keeping its traditional position of independence, it must refuse to meddle with, or to be dominated by, divinity, morals, politics, or rhetoric.

Against this view there was a rising tide of dissent on the part of scientists who urged a greater recognition of the social responsibility of science, and it may be noted that Hill himself in later years occupied a government post.

After World War II

During World War II, as it is now obvious to everyone, science came to occupy an altogether new place in society. For the first time it became clear to the great majority of non-scientists in the population that science is not merely a tool for social benefit and advancement but is in fact the major weapon in the arsenal of every power, peaceable or aggressive. This truth first became apparent through the great success of the scientific teams assembled for what came to be called operational research (in the United States, operations research). Vannevar Bush, as head of the Office of Scientific Research and Development in the United States, became one of the leading wartime figures as success followed success in meeting difficult military problems with scientific analysis, and in developing novel weapons, such as the proximity fuse, and novel systems of defense, such as radar.

The greatest impact of scientific discovery and the work of the scientists on military problems was revealed only at the very end of the war, with the explosion of the atomic bombs over Hiroshima and Nagasaki. The letter from Albert Einstein to President Franklin D. Roosevelt, written on August 2, 1939, and setting forth the possibility of controlled nuclear explosions through atomic fission, while voicing alarm that the German scientists might achieve this radically new weapon first, marks not only the beginning of a new military era in human affairs but equally the beginning of a new relationship of science to society, and consequently a new political role to be played by scientists. The importance of the event was that the foresight was the scientists' and the initiative also became theirs. In the days of the vast Manhattan Project, hundreds of academic scientists on leave from their institutions worked on "the hill" at Los Alamos or in the confines of the great secret city later to be known as Oak Ridge. With the success of the undertaking and the first use of the bombs in Japan, conscience was quickened in men appalled at what they had let loose in the world and fearfully prescient of direr things to come. In 1946 the Federation of American Scientists was formed, and the independent *Bulletin of the Atomic Scientists* was founded, to give vigorous expression to views about the relationship of science to government and the appropriate formulation of policy. Wartime and postwar secret preparations for chemical and biological warfare embroiled many chemists and biologists in the same schizoid cleavage between their desire for national security and their fear of a worldwide destruction of civilization.

Science under Political Pressure

An example of science under political pressure was the Soviet genetics controversy, which first commenced in 1929, had reached a climax in 1939, when T. D. Lysenko succeeded in his bitter attacks on "classical" geneticists, whom he scornfully called mere idle game-players who contributed nothing to the welfare of the state, in agriculture or otherwise. Lysenko attacked "Mendelian-Morganian genetics," as he slightingly termed this most developed and quantitative branch of modern biology. Classical genetics is based on chance, he said, and so must be completely unscientific. Nor does it rest on a sure basis in dialectical materialism. In contrast, Lysenko put forward the results of his own "researches," which claimed to break down the fixed heredity of crop plants by harsh treatments, so that, for example, winter wheat could be converted to spring wheat. By grafting plants of different genetic types together, Lysenko further claimed to be able to change the heredity in the seeds from the grafted part, and so to transmit the new character to the next and later generations.

Having accomplished in 1939 the downfall of Nikolai Vavilov—probably the greatest Russian biologist of our time—along with that of such other great geneticists as Karpechenko, the first human creator of an indubitable new species, Lysenko struck again after the close of the war. In 1948, having secured the full endorsement of Stalin and the Central Committee of the Communist Party, Lysenko dominated the fourth Russian conference on genetics. Not only were all the remaining notable Russian geneticists removed from their posts, but several members of the Soviet Academy of Sciences who were merely sympathetic toward "Western, idealistic genetics," including L. Orbeli, noted physiologist, and I. I. Schmalhausen, one of the world's foremost students of morphology and evolution, were relieved of their posts. The heavy hand of government rested hard on Russian science until the death of Stalin, and psychology, statistics, and other fields suffered similarly. Nor have they recovered. Following a period of decline Lysenko has regained at least some of his influence, and hopes for a rapid revival of genetics and other modern biological fields of work have been dampened. Lysenko's latest outburst was a tirade on the foolish Western idea that deoxyribose nucleic acid has anything in particular to do with heredity.

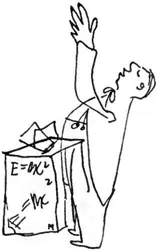
In another land, political domination over science reached the ultimate extremity. In the Nazi state it has ranged from subservience in the design of weapons, such as the V-2 bombs, to notoriously warped and twisted racist doctrines that claimed support from genetics and were used as a justification for the persecution and extermination of some millions of helpless Jewish citizens and captives and to the final depravity of the so-called "medical" experiments conducted in the concentration camps. The state dictated what scientific views might be held and what direction scientific work might pursue.

Money and Responsibility

Since World War II the scientist has come to occupy a very special place in relation to government. In the United States numerous agencies began providing funds to support scientific research through contracts or grants. The Office of Naval Research, the Atomic Energy Commission, the U.S. Public Health Service, and the National Science Foundation were notable in this respect. The National Science Foundation, established in 1950, at first had a relatively minor share in the total budget of supported research; but it has performed the valuable function of serving as a pace-setter and keeping the support focused on basic, rather than technological, aspects of research. With added financial support for research (reaching a total of $1 billion for basic research in 1959–60) there has come a burden of added responsibility in advising governmental agencies, not only on approvals of grants but on many other matters where expert technical advice is needed. These services rendered to governmental agencies have inevitably served to stir in many scientists a feeling of greater political responsibility.

The Russian and American rivalry of the post-Sputnik era has intensified these trends. James R. Killian, Jr., then Special Assistant to the President for Science and Technology, summarized these to the end of 1958 in a speech to the American Association for the Advancement of Science. Funds for the National Science Foundation were increased from $50 million in fiscal 1958 to $136 million in fiscal 1959. The Department of Defense reorganization act laid great emphasis on technological advancement and provided for the appointment of a Director of Research and Engineering. In 1958 the National Aeronautics and Space Administration was established. The national defense education act was passed. The State Department reestablished the office of Science Advisor and again began to appoint scientific attachés. A Science Advisor to the Secretary General of NATO was appointed and a NATO science committee established. The International Geophysical Year was successfully carried forward for 18 months. A second Atoms-for-Peace Conference was held in Geneva. Most important of all was the incorporation of the President's Science Advisory Committee into the White House organization and the elevation of its chairman to the status of a full-time special assistant to the President. According to Lee DuBridge, president of the California Institute of Technology, this committee "has quietly and effectively rendered enormous service in bringing to the President, the Cabinet, and the National Security Council the best scientific advice in the country on problems of national defense, international relations, public health, education, and the encouragement of research. This committee should be continued and strengthened and its advice continually sought at the highest levels of government. If this organization is kept strong there will be no need for a Secretary of Science."

There has been repeated discussion during recent years of the desirability of having a secretary of science in the Cabinet itself. This was strongly advocated by Wallace Brode, when he was Science Advisor to the State Department, and president of the American Association for the Advancement of Science. Bills have been introduced in Congress to establish a department of science in the federal government, but so far have not passed either house. Opinion is divided among scientists themselves as to the advisability of this measure. Many of them think that science can play a greater role in government through an advisory structure such as now exists, than it would were all, or a large part, of the present scientific activities of the government to be concentrated in a single department. Nevertheless, as in the move to establish the National Science Foundation, scientists are now actively interested in this proposal; and whether it be eventually carried out or defeated, it is more than probable that scientists will be largely instrumental in determining the issue.



Extrapolation and Restraint

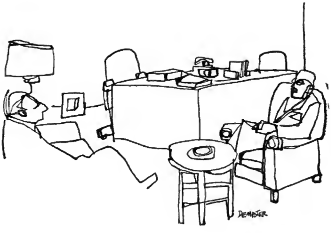
The political debates—for such they are, rather than purely scientific discussions—over the effects of fallout and the desirability of continued testing of nuclear weapons, and over the military inviolability of outer space, have been spearheaded by scientists rather than more conventional political figures. Linus Pauling and Edward Teller, as spokesmen for antithetical points of view, have become familiar figures to millions of Americans. The roles they have assumed illustrate sharply the acutely uncomfortable position in which a scientist is placed, since he can possess personal familiarity only with the relevant facts within his own limited area of expert knowledge. Pauling is a physical chemist, Teller a nuclear physicist; but both have been led in the heat of argument to discuss matters of genetical and other biological effects of radiation far outside the areas of their personal scientific knowledge. The consequence is easily guessed. They are carried away by the conviction of the rightness of their opinions, and make extrapolations from the existing facts that are scarcely trustworthy, or are even lured into flat misstatements.

A striking example is to be found in Teller's article for *This Week* magazine in the Sunday newspapers (October 9, 1960). In order to emphasize the hazards to a highly organized and crowded country of the proliferation of nuclear reactors for power, and the yet greater hazards of nuclear-powered ships, to say nothing of planes and automobiles, Teller would strengthen his case by belittling the hazards of radioactive fallout from weapons testing or from x-rays used in medical or dental diagnosis. So he says: "Practically all Americans, even including some scientists, think the insignificant amounts of radioactive fallout from nuclear experiments are harmful. Other scientists, including myself, are convinced that this is not true."

The prevailing scientific opinion is far better revealed by the carefully chosen words of the National Academy of Sciences' Committee on the Genetic Effects of Atomic Radiation in 1956: "Any radiation is genetically undesirable, since any radiation induces harmful mutations. . . . The genetic harm is proportional to the total dose." Or, from the report of the United Nations scientific committee on the effects of atomic radiation: "Even the smallest amounts of radiation are liable to cause deleterious genetic, and perhaps also somatic, effects." The U.N. committee indeed estimated the worldwide number of major genetic defects arising from fallout if tests were continued at the previous rates—a figure somewhere between 500 and 40,000 annually when equilibrium is reached. To be sure, the dose from fallout is as yet very small, even in proportion to the natural background radiation received by every one; even so, it is not, in the opinion of all informed geneticists whom I know, to be considered as negligible.

Teller continues: "The fallout scare in this country has had a tragic result: Thousands of persons have been so frightened by the specter of radioactivity that they have refused medical and dental x-rays. . . . The harmful effects of diagnostic x-rays are insignificant. But the dangers of refusing x-rays are considerable. By avoiding diagnostic x-rays, people have lost teeth to cavities and lives to lung cancers. Thousands of others have, unfortunately, refused simple and safe radioactive treatments for the painful and much more dangerous alternative of the surgeon's knife."

When he makes remarks like these, a physicist is clearly outside the limits of his scientific competence and is making wild assertions which he hopes people will accept because he is a scientist, and is therefore supposed to speak with careful weighing of facts and restraint in language. One might well challenge Teller on his statistics, since so far as I know there is no basis for saying that thousands of persons have been frightened into refusing medical and dental x-rays. On the contrary, the discussions of the harmful effects of small doses of x-rays have had a salutary effect, in that the needless use of x-rays in certain circumstances and with poorly shielded or uncalibrated instruments has been reduced. Radiologists have taken very seriously the estimates made for the National Academy of Sciences genetics committee that in the United States the average exposure to medical and dental x-rays approximates the radiation received from the natural background in the 30-year span of the mean reproductive lifetime; and they have initiated measures of great value in reducing needless radiation. In part, this has been accomplished by replacing fluoroscopies with radiographic pictures, in part by eliminating routine pelvimetries and x-ray pictures of expectant mothers, and in part by attention to improvements in techniques—faster film, better shielding of parts that do not need to be exposed, etc. For these reasons, the National Academy of Sciences genetics committee in 1960 commended the medical and dental professions "for their continuing efforts to reduce diagnostic and therapeutic radiation exposures to the lowest levels consistent with sound medical and dental practice."



Suspended Judgment

I have discussed this matter not in order to disagree personally with Teller, but rather to reveal an all-too-common tendency of scientists in politics to abandon their scientific reserve and suspended judgment, and to give way to special pleading. Contrast with this the attitudes of the geneticists with whom I have served on the National Academy of Sciences Committee on the Genetic Effects of Atomic Radiation. When faced with the need to make some kind of estimate of genetic damage from a given dose of high energy radiation, many of these scientists were dismayed. How is it possible to make any such estimate, they asked, when we know definitely about induced mutation only in fruitflies and mice—and to so limited an extent—or in lower organisms or plants? Extrapolation to humankind is surely not safe in the face of our great ignorance of many factors: the external dose; the internal dose to the gonads; the sensitivity to radiation of human genes; the uncertainty regarding the differences in effect of different rates of dosage and kinds of radiation; and a great many other factors. Only when faced with the clear and inescapable fact that if, in the present juncture of human affairs, they refused to make any estimate, then someone far less qualified would be forced by political exigency to do so, did they reluctantly agree to make some estimate, with due recognition of the vast range of uncertainty it possessed. Surprisingly enough, the estimates made by different American geneticists working independently, and by members of the parallel British committee, were in reasonably good agreement.

There is a lesson for us here. It was well expressed by Dr. Killian in the conclusion of his speech, already cited, to the American Association for the Advancement of Science in 1958:

> The growing linkage of science and technology with government demands of science a new order of poise, steadiness, and statesmanship. It demands of scientists who serve in advisory capacities a deep understanding of the role and limitations of the advisor.
>
> The current emphasis on science, if it is not to cause reactions adverse to science, also requires of the scientific community humility and a sense of proportion. It requires of scientists a recognition that science is but one of the great disciplines vital to our society and worthy of first-rate minds, a recognition that science is a partner—sharing and shouldering equally the responsibilities which vest in the great array of professions which provide the intellectual and cultural strength of our society.

During the recent political campaign for the Presidency, a further sign of development in the role of the scientist in political life has become evident. Both Republican and Democratic parties stressed the importance of science to the nation in their platforms, and both appointed committees to prepare reports on needed measures. The Republican committee on the impact of science and technology, while preparing a broad and significant statement, entirely lacked scientists in its personnel (two businessmen, a doctor, two architects, a college administrator, an opinion researcher, a laboratory administrator, and a broadcaster) and so failed to come to grips with many crucial issues. The Democratic advisory council in contrast appointed a committee on science and technology composed of scientists, and many of their proposals, such as the recommendations for establishment in the federal government of a national peace agency to devote technical skill and operations research analysis to the multifarious problems that must be solved if peace rather than war is to be achieved, were written into the platform of the Democratic party and were strongly endorsed by its candidate. Clearly the party in power will have the machinery of government, in the form of the President's Science Advisory Committee and Special Assistant for Science, to lean upon. It is greatly to be hoped that the minority party will, in the future, continue to maintain some sort of science advisory structure in its organization. It is hard to see how else it can keep up with the tremendous, growing problems of science in society, at peace or at war.

International Activities

Finally, on the international scale, scientists have become politically very active. Disarmament and arms control negotiations are now conducted by scientists teamed with diplomats, although currently their success is none too obvious. But the question of whether underground nuclear testing can be generally detected or whether it can be muffled and concealed to escape detection can only be discussed by those technically competent in such matters. Until they have reached agreement, the diplomats cannot begin. The trouble seems to be that often scientists engaged in such efforts have forsaken the scientific approach to the problem at issue, which would involve some carefully planned and mutually supervised tests to find out a few hard facts, and instead have limited themselves to table discussions.

An unofficial and perhaps ultimately more hopeful attempt to reach international understanding has endeavored to utilize the international character of science itself and the objectivity of its practicioners. This is the effort to establish a series of international conferences of scientists resembling somewhat in organization the professional international congresses, but devoted to problems of world peace and understanding.

In July, 1955, Bertrand Russell composed a letter to embody certain conclusions developed in conversations between the Federation of American Scientists and the British Atomic Scientists' Association in 1953 and 1954. Signed by Albert Einstein, Max Born, and eight other notable scientists, this declaration read in part:

> In the tragic situation which confronts humanity, we feel that scientists should assemble in conferences to appraise the perils that have arisen as a result of the development of weapons of mass destruction. . . . We have to learn to think in a new way. We have to learn to ask ourselves, not what steps can be taken to give military victory to whatever group we prefer, for there no longer are such steps; the question we have to ask ourselves is: what steps can be taken to prevent a military contest of which the issue must be disastrous to all parties, . . . There lies before us, if we choose, continual progress in happiness, knowledge and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels? . . . . We urge the governments of the world to realise and to acknowledge publicly, that their purposes cannot be furthered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them.

That statement was signed by Albert Einstein just two days before he died. As a consequence of this appeal, and through the generosity of Cyrus Eaton, who offered his residence in Pugwash, Nova Scotia, as a site for the first such conference, the "Pugwash" Conferences on Science and World Affairs (COSWA Conferences) were launched. Eight of these conferences have been held to date, three in Canada, two in Austria, one in Moscow, and two in the United States. These conferences have shown that scientists from opposite camps of the world struggle can in fact meet and discuss the basic problems of arms control and world security objectively, although initial mistrust is always to be overcome. As a participant in five of these conferences and a planner of more to come, I hope that a spirit of mutual confidence in the scientific integrity of our fellow scientists from countries with different social structures, economic goals, and cultures, as well as different languages, may nevertheless overcome fear, doubt, and skepticism and lead to some degree of accord. If this is possible, then to the extent that governments will give ear to the advice of their scientists, negotiations for the control of armaments and the assurance of peace may even yet be possible.

Building the Peace

The weapons the scientists have made can destroy civilization in a night—even in an hour. Is there no recourse except in our blind need for national security to build them ever more efficient and ever more deadly? Can we not also aid in building a lasting peace? The scientists indeed have a great responsibility, as the challenging refusal in 1957 of 18 notable German nuclear physicists to have anything to do with German nuclear armament makes quite evident. The 1960 report of the Committee on Science in the Promotion of Human Welfare of the American Association for the Advancement of Science asserts:

> It is not enough for scientists to inform and advise Government agencies. The scientific community should assume on its own initiative an independent and active informative role, whether or not other social agencies see any immediate advantage in hearing what the scientists have to say. . . . And what scientists have to say about the social implications of science should be addressed to the general public.

The situation in this country and in other countries of the world, owing to the nature of our international tensions, has become such that for any young person, scientist or non-scientist, to dare an unconventional solution to a social problem is sufficient to make him be labeled as a communist or anti-communist, depending on which side of the Iron Curtain he resides. I firmly believe that if our nation is to survive its present peril and compete in days of peace with the growing communist strength of the socialist nations of the world, then we must not only be able to deter them from using their weapons, but we must outthink them and outdare them in the kinds of solutions we propose for the still critical problems of our own society. This is the paramount task of our time. We desperately need leaders, and yet the attitude in our country on the part of the majority of our population is such as to dampen and stifle independent thinking and daring suggestion.

The scientists of our country, I also firmly believe, have a particular responsibility to see that this attitude is counteracted and that out of each young generation of college students there will come leaders of our people who will understand the place of science in society, who will think daringly, who will seek in humility solutions to the problems of our times. I do not know whether or not we can do this. I know only that it is necessary and that no mere avoidance of war will save the intellectual freedom of America unless this comes about.

The Hobbled Weapon

STEVEN R. RIVKIN

CHANGING relationships between the military postures of the U.S. and the Soviet Union may well exert far-reaching implications on the problems of arms control. Where once a large military advantage lay with the side that could execute a paralyzing first blow, the advent of "invulnerable" weapons systems now promises to diminish this advantage and produce a strategic equilibrium that could prove less volatile in important respects than that of the present.

To infer from this development that the world is becoming a much safer place would be hazardous and unwarranted in the face of overall improvements in weapons technology. But the grim truths of the situation should not obscure those that are more hopeful. One such proposition, drawing wide acceptance within American strategic thought, and emphatic support in the federal budget, is the cautious view that the advent of secure retaliatory forces will reduce incentives for surprise attack. When both antagonists possess secure retaliatory forces simultaneously, a limited degree of increase restraint over the prospects of central war can be foreseen. A second and more controversial proposition, derived from the first, is that "deterrent stability" based on the mutual possession of invulnerable forces may actually offer unique opportunities for control and possible disarmament of strategic nuclear weapons beyond the mutual reassurance yielded by the new military balance itself.

An aspect of this latter estimate is developed here. Systematic attention to the consequences of mutual invulnerability is hampered by the difficulties of speculating extensively on an assumption that is still unproven and unspecific. But when such an assumption becomes a major premise of our defense planning, an attempt at clarification is a legitimate exercise. Exploration of terrain beyond the current horizon may perhaps suggest anticipatory action to accelerate and shape the prospect of mutual invulnerability.

The Hobbled Posture

Even with the development of secure retaliatory capabilities on both sides, there may still be strategic aggression. This can yet occur through major technological success in counterforce development, the employment of graduated blackmail, human or mechanical error, or the willful inducement of catastrophe. Assuming that significant technological breakthroughs have become improbable, none of the remaining options represents a reliable national policy, yet the continuing existence of these avenues will provide a constant source of anxiety and irritation that even the most peaceful national facade could do little to diminish. Under these circumstances, if the retention of first strike forces can serve no useful purpose, then might not their specific and selective elimination produce positive advantages?

We begin with the following hypothesis: both the U.S. and the Soviet Union will jointly eliminate their options to carry out first strikes upon each other's territory, *while retaining the capability for effective retaliation in the event of the prohibited first use by the other side.* This hypothesis may strain credibility by presuming the possibility (thus far undemonstrated) of a successful distinction between weapons systems directed to first strike use and to retaliation.

Today's invulnerable weapons are expressly designed to fire reliably after a first attack; nonetheless, such weapons are also capable of first strikes. If these second-strike weapons could be "hobbled" to the point where their capabilities to strike first are eliminated, the double-threat systems of today would thus be transformed into *second strike only* weapons—weapons which could not be utilized unless the territory of the nation possessing them is fired upon first. If a nation had these weapons and only these in the class of systems capable of strategic use, a national second strike only posture would be assumed. For example, a Polaris submarine would have no first strike capability when kept out of firing range of its targets, while retaining its retaliatory role, and a land based Minuteman system could perhaps be hobbled mechanically to make armed firing depend upon a prior attack. If all American strategic forces were subject to hobbles adapted to each system, the requirements for an overall hobbled posture would be met.

Each party would then have reciprocal "legitimate interests" in his own and his adversary's strategic nuclear forces. Each would want to achieve and maintain unimpeded capability for retaliation if attacked, while requiring a hobble sufficient to prevent the other from firing first, supported by reliable verification.

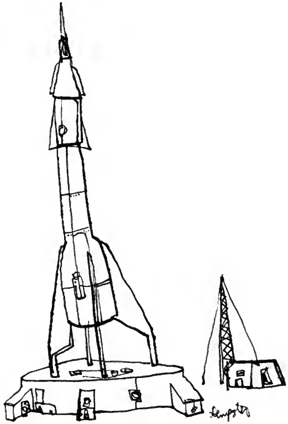
The assumption by the U.S. and the USSR of this position would represent policy choices to accept the stalemate implicit in mutual invulnerability, to demonstrate unequivocal defensive intent without surrender of defensive, retaliatory capability, and to hold the arms race at a comparatively advantageous point for both sides. These choices would be affected by removing a major source of anxiety, irritation, and impetus to preemptive attack. The realism of this situation would depend on the validity of several assumptions about the nature of current East-West conflict. These assumptions include the mutual commitment of both sides to preventing their own destruction. They include, as well, the growing realization that competition to develop offensive capabilities of overcoming an enemy's invulnerability is increasingly expensive, with consequences so risky and arbitrary for conservative world powers that they outrun desirability. Furthermore, it is assumed that both sides can act with energy and imagination to control the momentum of present strategies if the alternatives to such innovation are manifestly contrary to self-interest.

Unwatered emphasis on strategic defense is admittedly open to easy condemnation as Maginot Line thinking; it can be asserted in rebuttal, however, that such conventional analogies possess no automatic relevance to a world dominated by invulnerable nuclear weapons. Too, there is a distinction between a second strike only posture and Herman Kahn's Doomsday Machine. Where the latter would provide a hair-trigger, automatic response to first attack, the hobbled posture would provide capability for nothing except retaliation, and that only when expressly ordered to respond. To underline this distinction, the present concept might be lightly styled a Resurrection Machine.

Some Workable Systems

A beginning for building the desired posture can be found in the axiom that the whole is equal to the sum of its parts. In this light, the first-strike capability of a nation consists of the aggregate of a fairly small number of expensive, complex weapons systems. Today there are still fewer systems that are also useful for retaliation, although the number of kinds of weapons is expected to grow substantially. Retaliatory weapons are fairly autonomous in their deployment and operations, in order that they may survive even if their nation perishes. This autonomy means that all such systems, notwithstanding their mutual diversity, fall roughly into common types and patterns of operation.

The hobbling process may be described in two ways. First, a weapon may be made *incapable* of firing first; however, incapability could probably be achieved merely to a relative degree. Thus it might be more appropriate to speak of hobbling as placing a penetrable barrier before the use of a first strike, a barrier that would impose difficulty and delay and give warning. Such a barrier might be uniquely constructed for each retaliatory system to varying heights and degrees of toughness, approximating in the end virtual incapability of a first strike.



Present U.S. plans involving *landbased* missiles to achieve invulnerability rely principally on the Minuteman solid-fuel ICBM dispersed in hardened concrete silos (with mobility by rail or highway currently in disfavor). Presumably, the warheads of these weapons must be brought to a critical mass in advance of firing; public discussion implies that this arming process is accomplished either by electronic or mechanical means. Eliminating the first-strike capability of these weapons could therefore be accomplished by making the arming mechanism responsive solely to some positive indication that the United States was under enemy attack.

Such a signal could come from several sources, including the alarm of a BMEWS or other alerting device relied upon by SAC to give warning of impending attack or the signal of a bomb-alarm system designed to react to unequivocal evidence that nuclear weapons have impacted on U.S. soil. Of these two mechanisms, the bomb-alarm system—composed of a network of radiation, sound, and shock-sensing devices—would seem a more reliable indicator.

If the operation of these components is so straightforward, and there is no apparent reason to assume that it is not, the bomb-alarm and arming mechanisms could be paired with fairly little difficulty; the critical problems would come in rendering the hobbled system foolproof and reliable. The system could be fooled at either its sensors or its arming points, and communication lines could be cut. An aggressive possessor could arm by short-circuiting the system, and an aggressive enemy could seek to paralyze his opponent's retaliatory forces to escape scot free. Consequently, without reinforcing safeguards, the system might offer little assurance to its participants. A constant "safe" signal from the alarm in normal times could arm the system when interrupted; then the treacherous possessor would have to short circuit or muffle the safe signal, while the treacherous antagonist would have to duplicate his enemy's signal. On the other hand, a normally silent system emitting a positive alarm in the event of attack would be subject to counterfeiting by a possessor and sabotage by the antagonist. But if joint inspection teams were stationed at critical points of the system—the sensors, the communication lines, and the arming points—then tampering could be greatly complicated. Whether an effective inspection system could thus be devised must be subjected to detailed and practical proof.

Submarine Systems

The bomb-alarm restraint would be less applicable to the Polaris-armed submarine, due to the complexities of reliable underwater communication. However, two simpler and possibly more feasible methods are suggested by the range limitation of current submarine systems, which could be employed to deactivate, if not extinguish, first-strike capabilities. In one formulation, an early-warning submarine detection net might be set up at extreme firing range from each nation's territory, currently presumed to be about 1200 nautical miles; to make the net properly sensitive, it might consist of picket ships at 100-mile intervals supplemented by aerial patrols. An enemy would undertake to keep his submarines beyond firing range, and perhaps to fit his vessels with IFF (identification-friend-or-foe) devices similar to those adopted for recognition of military aircraft. These IFF mechanisms could be sealed and "bugged" with alarms against tampering anywhere, and an inspection census of all submarines would be taken at periodic intervals. When a submarine crossed the warning line, its violation would be revealed, though possibly not its position, depending on the penalty desired. Controls would also be implemented on land areas within a 1200-mile range to prevent submarine portages, and at major enemy ports to prevent refitting with longer range missiles or disabling the warning devices.

An even simpler variant of the same scheme would depend on positive evidence from the controlled submarine of its daily position. The vessels would show up *seriatim*, one at a time so as to avoid presenting a meaningful counterforce target, and communicate their identity and location. In a similar fashion to the negative evidence warning system, controls would be instituted to prevent arming with longer range missiles, and each submarine would have a unique means of being reliably recognized.

Applied to submarines, these limitations would have several unique by-products which should be noted. If Communist China were to reject inclusion within controls imposed on Soviet forces, the geography is such that U.S. submarines could have major portions of China amply targeted without threatening a first strike against the Soviet Union. In addition, a Western submarine force could be developed with NATO participation, thus extending to the territory of Western Europe the unambiguous yet secure deterrent capabilities of a second strike only force. Finally, the retaliatory capabilities of submarines may perhaps be peculiarly subject to the preservation and enhancement of their security through maneuver as well as proliferation in numbers.

The net effect of each of these variants of the second strike only concept would be to create a system with no immediate first-strike capability and a feasible second-strike capability, which could be exercised in the case of the alarm dependent system by firing missiles when armed or by the Polaris submarines when moved on station. Other formulations of the same concept may be equally imaginable. The three suggested above relate to the first and the last of three identifiable stages of a missile's flight: launching, flight, and impact. Flight might similarly be inhibited by a device for self-destruction or interception of a missile on a mission other than retaliation. Here, however, the possibility of deception might be unacceptably large. Hobbles presumably could be adapted to other strategic systems designed with retaliatory capability. Long-on-station aircraft, like the proposed nuclear-powered airplane, could be subject to restraints similar to those suggested for either land or sea based systems, with their speed and communications requirements posing unique problems. Bombs in orbit would be unsettling in this regard, as in most others, but possibly not unresponsive to similar restraints.

An Arms Control Role

The three systems emphasized above vary in the degree of anticipated interference by inspectorates within a nation's command structure, with the positive evidence Polaris system the neatest and simplest. Whether minimum interference in the operations of a weapons system will be particularly desirable is probably arguable, since the extent of inspection required for a single system may be a very secondary consideration. What is clear, however, is that the ability to construct single systems capable of second strike only performance is a far cry from the achievement of a hobbled national posture. Between the technical development of hobbles for existing weapons and the achievement of overall hobbling objectives lies a difficult course of bargaining, negotiating, testing, and proof. Possibly, there may be more than one useful stopping place along the way.

One especially critical requirement, arising whenever significant reliance would be placed upon the integrity of particular hobbled weapons, would be the competent functioning of inspection extrinsic to any individual system. Efforts to break or circumvent a set of controls with a view to eventual blackmail or surprise would presumably take place in secret and without disturbing a facade of compliance. Where expectations and reliance are great, competent verification would require active and aggressive penetration by inspectorates of military forces other than the specific system under controls, and of all research and development activity relevant to counterforce capabilities. Consequently, as the drive toward a hobbled posture approaches its objective of the total absence of first-strike capability, acceptance of quite substantial levels of inspection and control would be essential.

Significantly, these levels of inspection and control would be required at a point when sensitivity to misused inspection information would probably be markedly diminished over the situation which currently frustrates even the most reasonable disarmament proposals. If side A's capability were eliminated for executing a first strike (presumably counterforce), side B would be far more likely to accept heavy and effective inspection without fear that this inspection would serve as a conduit for espionage. This would occur when, lacking the capability to exploit target information, side A would be incapable of benefitting at side B's expense.

Hobbles for All

The first step in the reciprocal development of hobbled national postures would consist of mutual negotiation and unilateral research effort to establish the feasibility of hobbling separate systems and cumulating the result. Between this beginning and the final objective of symmetrical hobbled postures, a number of issues would remain to be negotiated, proven, and agreed upon, including the correlation among nations of hobbles for specific systems, the enhancement of retaliatory capabilities to counter any degradation, the extension of inspectorates to areas of military and industrial structure extrinsic to any particular system, and the inclusion of other nations' strategic forces. As a general rule, insulation against risk would be essential in order to avoid any particular "cross-over point" of maximum danger and to enable the progression to develop with maximum stability.

Specifically, the initial burden of developing second strike only systems would be undertaken by the nation being hobbled, with an attendant prospect that each could cheat in its own favor; no other method of development in such sensitive areas would appear acceptable amid prevailing attitudes of mutual mistrust. Then would come the stage of evaluation in which each side would judge for itself the effectiveness of its own formulation (according to criteria of deterrence—the retention of adequate retaliatory capabilities) and of the enemy's effort (according to arms control criteria—the effectiveness of the enemy's hobbles to inhibit his first-strike capabilities). Obviously, the latter will be the more formidable problem, for a nation must be convinced of the reasonableness of its adversary's efforts in order to keep up its own participation. This means that the enemy's system for a particular hobble must not only work as he says it will work, but that his acts must contribute to an inherently valid comprehensive hobbling formula. In other words, each participant will have to be convinced that his enemy is proceeding regularly in a useful direction. His adversary, realizing this, will be under pressure to be convincing in his demonstrations as long as he desires to reap the benefits of participation, and these pressures would be mutually self-enforcing.

Unilateral Hobbles

Once agreements can be reached on the composition, deployment, and integrity of the desired forces, efforts could be undertaken on a unilateral basis to develop, install, or modify these systems. When achieved and implemented, these systems could become more significant as they become a proportionately larger part of a nation's strategic force by expansion or by reduction of first-strike systems. Progressively, exposed Atlas and Thor missiles could be destroyed, along with those retaliatory systems less susceptible to hobbling, and intensive inspection begun of production facilities and weapon storage areas to verify compliance. The ultimate end would be that a nation's strategic capabilities had shrunk to hobbled systems alone and that inspection systems were operating to bar current or future redevelopment of prohibited forces. In reaching this objective, the so-called "inventory" question would probably decline in significance from its current importance; for, if mutually acceptable second strike only forces are developed and deployed early in the process, a country possessing such systems would be able to feel itself secure in relying upon them for deterrence. It would then follow that a nation with such forces would be under no compunction to prevent inventories of its other strategic forces preparatory to their destruction.

As a practical beginning, the U.S. might offer to construct and demonstrate the operations of hobbles upon a particular system, the Polaris being the most likely example. Thus, either in return for a parallel concession or without prior condition, we could invite the Soviets to witness the withdrawal of a substantial number of submarines, one-quarter or one-half of our entire force, beyond immediate firing range. Guarding against the appearance of a propaganda stunt or a heavy-handed deception, we could proceed to identify these vessels regularly to the Russians and promise further and more durable hobbling in response to parallel Soviet participation, initially with similar informality. The effect could be dramatic, for if we were preparing a surprise attack we would be foolish to remove substantial megatonnage from the fray, particularly under any circumstances where a counterforce strategy would place a high value on the greatest possible saturation of the recipient's target areas.

Thus a progression of controls could be initiated to be cumulated, system by system, as each particular hobble is satisfactorily developed. Since hobbling techniques would differ and some would be more difficult to undertake than others, it would be appropriate for the process to take place on such a single system basis, providing scope for continued bargaining along the way. For the United States, these bargaining positions could aim at the objective of retaining, at the end of the progression, several diversified hobbled systems so as to hedge against the consequences of a Soviet technological breakthrough against any particular system.

Meanwhile, system by system hobbling would constitute a precaution against interrupted negotiations, making each stage sufficiently self-sustaining so that the progression up to that point need not have been either valueless or destabilizing if left to stand alone. To prevent malingering, however, negotiations at all times should be pitched as far as possible towards facilitating the progression to a totally hobbled posture, to provide both momentum and leeway for compromise. The anguished history of the test ban negotiations implies that attempts to negotiate less than comprehensive controls with only narrow face value can be highly unproductive for all the effort expended. As a serious objective, therefore, the development of partial constraints of such complexity would probably involve excessive effort in proportion to possible gain and would not exploit the concept's much broader potentialities for cooperation upon a basis of full and faithful adherence to a set of compelling principles.

Should the end of this progression ever be reached, it would appear that the second strike only posture might then possess unique "follow-on" potentialities which could add to its attractiveness for nations seriously seeking substantial disarmament. In a framework of controlled deterrence, command over the hobbled systems would remain in the possessor nation. But should the adversaries ever agree to disarm their strategic forces entirely, a degree of parallelism will have been achieved which would permit the final elimination of strategic weapons by turning the "second strike only fire" controls over to neutral umpires. Thus the ultimate anomaly referred to earlier, of "retaliatory" force in the absence of a first-strike threat, could be discharged in the wake of the more bitter anomalies of an uncontrolled arms race.

Some Hopeful Conclusions

Thus realized, second strike only systems would have contributed to making feasible a transition to fairly intensive levels of control, in which it is likely that the possibilities for serious accommodation in the field of strategic weapons could infect other thorny realms with similar hopefulness. In the achievement of its objectives, the concept formulated here represents an attempt to derive a control scheme that could maintain security for both sides without the wholesale abandonment of weapons considered essential to that security. Should each nation be able to innovate and develop its own hobbled forces, it need not fear that arms control would deny it the vital ability to carry out a successful counterstrike. The mutual abdication of a first-strike capability may meanwhile represent an exchange of a fruitless option for a real gain in security.

It should by now be apparent that the primary utility of the second strike only concept would not come from its immediate impact on an already stabilized strategic environment, although this impact could be useful. Aside from its manifest worth in diminishing the prospect of accident, the hobbled posture, to whatever degree realized, would also inhibit the "conscious" accident in which one side might wildly hope that its enemy would not retaliate out of either physical paralysis or a dead man's love for the living. But more significantly, the system would represent a resourceful attempt to remove a set of very real, very dangerous, and very irritating potentialities, without altering the current working basis of mutual deterrence. As such, it would offer a hopeful avenue of escape from most of the consequences of losing an arms race, while leaving essentially unimpaired the underpinnings of security thus far achieved. Something of a double ration of cake would thus be served up to both sides.

Should the potentialities of the concept be recognized before we enter the era of hardened strategic stalemate for which it is most reasonably suited, efforts could be begun in advance to prepare for the ultimate shifting of emphasis from postures of ambiguous threats to those of a mutual strategic defense. The preparation of research and development programs, the availability of second strike only systems on a standby basis, and informal demonstrations matched with serious negotiation to achieve further reciprocal effort would open up new opportunities to diminish risk through restraints over strategic weapons. To both sides, the ultimate utility would depend on confidence in the capabilities of each other's systems to serve design criteria. And to achieve this end, both time and exertion to developing technological competence will be required.

Mutual Advantages

For both the United States and the Soviet Union, advantages can be foreseen from adopting the hobbling restraints, beginning well before the transition to hobbled postures is complete. The United States would no longer have to threaten nuclear incineration in order to deter Soviet attack, and thus could escape the extreme bargaining limitations of credibility and effectiveness that fall to a representative democracy in threatening suicide as a daily act of policy. While an increase in requirements for exertions at nonstrategic levels would probably follow from the elimination of the option of preemptive war, these labors could well be preferred to the more explosive labors they would partially replace. Finally, it might be significant as a very long shot (and consequently as a factor that should not weigh too heavily in our analysis), that the dramatic removal of direct threats to Soviet survival could have desirable political consequences. Without the threat of imminent capitalist attack, a significant tool of Soviet internal control and ideological cohesion could be blunted.

For the Soviets as well, the specific advantages might be appealing. Though they might balk at heavy levels of inspection, they need not fear the weakening of their retaliatory force and might look forward to the end of U.S. counterforce strategies with their intelligence components and their constant latent threats of nuclear destruction. At the same time, the Soviets may look upon a world tranquilized at the strategic level as a more profitable arena for limited aggressions and subversions, as well as for nonmilitary competition. (U.S. policy, meanwhile, could not afford to be indifferent to the encouragment that this inducement might give to communist subversive activities.)

Finally, the analysis would not be complete without some reference to the psychological aspects of the concept as an arms control mechanism, or in the vernacular, its propaganda value. Western positions have often suffered unduly from criticisms of being overly cautious and insincerely committed to the Soviet-articulated goal of general and complete disarmament. Adopting the second strike only posture as an essential way station, desirable in itself even without further progression toward disarmament, would offer the Western position an appealing and hopeful catalyst, if the appearance of sophistry could be rebutted by informal demonstrations and proof of technological feasibility.

This last element is, of course, the sine qua non of the proposal which provocative theoretical elaboration should not mask. In their promise of practicality, however, the three formulations of hobbled systems suggested here endow the concept of the second strike only posture with possible substance beyond mere conjecture. Could such a posture be achieved with sufficient reliability to produce the necessary confidence in its possessor and his adversary? This is the ultimate question on which the leap of faith required from both sides would depend.

The author wishes to express his appreciation for helpful comments to Ithiel Pool, Carl F. U. Overhage, Howard Raiffa, and other participants in the Harvard-M.I.T. Joint Seminar on Arms Control, with which the author was associated when the present piece was prepared.

The University's Mission

P. M. S. BLACKETT

ONE OF TODAY's essential problems is the part that modern science and technology can play in the development of those new nations which are now trying to outgrow their present state of material poverty and economic backwardness. Apart from the problems of nuclear war, this seems to be the greatest and most important task of our day.

During the past five years, an important change has taken place in the attitude of the rich Western world to the underdeveloped, poor countries—those which have not yet reaped much benefit from the scientific and industrial revolution which has transformed the material way of life of Europe and its overseas descendants during the last tumultuous two hundred years.

Why in Europe?

One of the fascinating unsolved questions of history is why the scientific and industrial revolutions of the seventeenth and eighteenth centuries happened in Europe rather than in one of the great ancient civilizations of the Near and Far East. Craft technology may be said to have evolved to a very high level about five thousand years ago in the river valley civilizations of the Near East, and in India and China. By 2000 BC the level of building, woodwork, fine metal work, shipbuilding, and transport had reached a level which was not surpassed for nearly three thousand years. Then, for one reason or another, the great civilizations of North India, Egypt, and Mesopotamia became static and finally declined. Then China rose and was socially and technologically pre-eminent from 500 BC to 1500 AD when Europe started the extraordinary movement which produced the scientific and later the industrial revolutions, which were, in three centuries, to transform man's life on the earth.

The essential foundation on which this revolution was based was the high level of craft technology which was largely of Near and Far Eastern origin. What it was that prevented these ancient civilizations from making the scientific breakthrough is not fully understood. There is no evidence to suggest that there are any demonstrable differences of innate ability between the different races of the world. There may be some yet to be discovered, but it would be anyone's guess what would be the order if the races of the world were listed according to innate ability.

The only sound working rule is that the different peoples of the world, even though they are now at very different levels of development, have the same innate capacity for science and technology as do the rich and proud western Europeans who created the scientific revolution. Thus the vast differences between the material wealth of Europe, North America, and Australia on the one hand and India, China, the Middle East, Africa, and most of South America on the other, cannot be ascribed to racial differences. Almost certainly the differences were of complex social origin.

Strong Contrast

In the century and a half since 1800 AD the material standard of life of Europe has been multiplied by ten, and by much more in North America, while that in China and India has stood still or fallen somewhat. Today there are some 400 million people in Europe, North America, and Australia, and the white parts of Africa and South America, with an average income a head of some £400 per year. On the other hand, in Asia (excluding China), Africa, and South America there are some 1000 million people with an income of less than £40 a year each.

Nearly all these materially poor countries are now attempting to become richer by making use of modern scientific technology. And they are in a hurry. Few of their governments will survive for long unless they can provide a steadily rising material standard of life. A great increase of investment in roads, transport, electric power, houses, schools, factories, and industrial plants is essential. These things are expensive and the countries are poor. Moreover, many of these things have to be bought from the industrial countries with foreign exchange, which is nearly always in short supply. It is the poverty of these countries in general, and their shortage of foreign exchange in particular, which makes essential the giving of generous financial aid by the rich countries of the world.

The Need Plus the Will

For this aid to be effective, the recipient country must have the will and the administrative machinery to carry through the social and political changes essential to the process of modernization. There are only too many cases where foreign aid has been poured in, very often for political and military reasons, to countries with neither the will nor the social system to make good use of it. But there are many countries—India is an important example—where both will and necessary social conditions are present, and where the main check on progress is financial stringency. For such countries, generous foreign aid is urgent. The survival of parliamentary democracy may well depend on the amount and the speed with which this aid is given.

To carry out this process of social and industrial modernization, a developing country needs a modern educational system capable of producing the necessary teachers, administrators, civil servants, industrialists, doctors, scientists, and agriculturists. Without these, development cannot take place. At the early stages of growth, essential personnel will have to be engaged from the advanced countries. Since this is expensive and the supply precarious, a major objective for all these countries must be to produce their own intelligentsia.

There is now in the world a vast amount of scientific knowledge and technological knowhow ready to be applied for the purpose of raising the standard of life of the poorer countries.

Application, then Addition

The first task of such a country is to learn to apply existing knowledge; then will come the task of adding to knowledge, especially in fields such as tropical medicine and agriculture, where the required knowledge is not available. An adequate supply of doctors and nurses, piped water, main drainage, and public health measures generally are necessary before even known medical methods can be applied. Economic and social planning must be based primarily on existing technology; energetic efforts must be made to improve this technology, especially in relation to local problems, and there must always be readiness to make use of radical new developments should they arise. But development should not wait on new discovery.

Three Requisites

For a country which is now poor and underdeveloped to be able to transform itself into a growing and dynamic one, able to profit by the scientific and technological revolution of the last two hundred years, there are at least three requisites: determination to bring about such a change and to face up to all its complex social implications; financial resources to make the change; and adequate trained personnel.

Different underdeveloped countries have very different needs. India, for instance, has had a modern university system for very many decades and so can now supply the major part of the intelligentsia, professional, scientific, technological, managerial, and teaching personnel which are essential for the implementation of the national plan for economic and social advancement. India's vital need is for financial resources to carry out her plans; she has both the political determination and all but a small fraction of her needs for trained manpower; because of her large population, this small fraction may mean a considerable number.

However, many of the new emergent countries, particularly those in Africa, are in a very different situation. An acute shortage of local trained personnel exists at almost all levels, from technicians to professors. Such countries, even when they have the will and the money, will still need the help of foreign professionals for many years. Even with the most rapid growth of the whole educational system, many years must elapse before some of these countries can supply all their needs. In fact, it is the building-up of an educational system adequate to produce the essential local intelligentsia which needs at the start the help of foreign professionals. This problem is worldwide in scope and involves the general relationship of the rich industrial powers to all the now poorer and underprivileged ones, making international action on a wide scale essential; such international action is in fact now being carried out through the efforts of many agencies. But here I must confine myself to the problem of what part British universities can and should play in this task. In 1946, as a result of the Asquith report, a big plan of expansion of university education in the major British colonies was initiated by the British government. Directly or indirectly, the pattern today of university education in the universities and university colleges of Malta, Hongkong, Malaya, Ghana, Nigeria, the West Indies, Uganda, Sierra Leone, and several other institutions was set by the recommendations of the Asquith commission.

In 1960, in these approximately twelve overseas university institutions, there were nearly 10,000 students and an academic staff of over 1500. Of these some 700 were British. The fraction of local staff is low in the African colleges, from 10 to 30 per cent. Most of the British staff took up their posts in African colleges when these countries were still under colonial rule, but many have stayed on after the countries became independent.

A Convenient Arrangement

Most of these newly independent countries still find it convenient to make use of the administrative machinery available in Britain for the recruitment of foreign staff, especially the Inter-University Council for Higher Education Overseas (IUC). The scale of activity of the IUC is indicated by the fact that in 1960 it advertised 400 academic vacancies, received over 2000 applications, and finally recommended over 300 appointments. Of these, nearly one half were British, about a quarter local, and the rest from other countries. In all these cases the overseas university paid the full salary from its own resources. The British Council performed an analogous role to other overseas university institutions, mainly in non-Commonwealth countries. There are about 100 British academic staff members in posts overseas through the machinery of the British Council. The Council has funds to supplement salaries, but the IUC has not.

These figures emphasize that Britain has already a big stake in the higher educational systems of many developing countries, particularly of those in the Commonwealth. It is essential that Britain should be prepared to continue and extend this role in the future—if, and only if, the newly independent countries so desire. A first task is for Britain to find ways of maintaining the supply of able university staff under the new conditions of independence of these new countries, to make good the losses of existing staff, as they move on to other posts. The second task is to be prepared to increase the supply markedly to compete with the great expansion of higher education which is bound to take place when these newly independent countries begin to stride forward into rapid economic and social progress.

The scale of expansion of output of trained people in a new nation on the march is indicated by some figures taken from the Ashby report on educational needs of Nigeria. The need is estimated as some 2000 university graduates a year compared with the present output from the University College of 200. Two other universities are now being formed. In addition, there may at present be some 600 returning each year from training overseas. In Britain there is one university student to every 500 population—a low figure by the standards of most advanced countries; in Nigeria it is one in 20,000 and in Ghana one in 10,000. So it is clear that a great increase of university education, as a part of a planned increase of education as a whole, is a necessity in all the newly developing countries. Compared with some other colonial powers, Britain can claim that it did initiate local higher education on a substantial scale—the total number of students in these colonial and ex-colonial countries ten years ago was about a third of the present figure of 8000. Considerable as this achievement is, it is far below the real needs of these emerging countries.

Question of Means

If we accept the need of emergent nations for rapidly expanding higher education and the duty of the rich and developed countries to help, the question arises as to how this can best be done. One of the objectives of the expansion of the higher education systems of these new countries is to provide enough trained men and women from their own population to be able to dispense with the use of large numbers of foreign staff. This is already the case with India; in spite of its great poverty it does produce the majority of the trained people it needs. The ratio of university students to population in India is about the same as in Britain, though the standards are considerably lower in some institutions.

We may assume that many of the emergent African countries will remain dependent on expatriate university staff for a substantial fraction of their needs for a decade or more.

It is important to remember that these newly independent countries have no obligation whatever to look to Britain rather than to other countries for their ex patriate staff. They can and do stop elsewhere. However, our historic relations with these ex-colonies, and the fact that their common language is English, does provide a reason why many Britons are welcomed.

In colonial days most of the British academic staff

in these overseas universities and colleges were appointed for life, though, in fact, many only stayed in their posts for a limited number of years. Now when these countries are independent, and hoping soon to be producing their own candidates for these posts, there is much to be said for making administrative arrangements in Britain for people to take overseas posts for a limited period of, say, up to five years, with a guaranteed post in Britain to return to afterwards. There could be advantages also for the overseas university; it might not be wise to appoint a foreigner for life when equally good or better local candidates might be available within the decade. But the main advantage of working out some form of secondment for overseas service, rather than relying, as generally in the past, on finding candidates willing to take life appointments, is to widen the application lists and so to allow the selection of abler people.

Life Appointments an Obstacle

Though many academics might welcome a period of work in an overseas university, either for adventure, special opportunities to pursue research interests, or simply from a sense of service, they might be deterred from accepting a life appointment. The climate might not suit families; education facilities for children might not be available; or unwelcome political changes might ensue. Any of these circumstances might throw a man, perhaps in middle age with wife and family, on the academic labor market.

Many more might want to take these posts if they were assured of a post to return to after five years or so. In a civil service, appointment to overseas service presents little difficulty and is, of course, usual in the foreign and consular branches. Since British university staffs are not civil servants (they are in France so secondment would be easier) other ways must be found. It has often been suggested that the universities should be given extra funds to enable them to have continually some fraction, say five per cent, of their staff at any time on overseas service. Unfortunately there seems little chance that such funds will be available at any rate for several years.

Filling the Gaps

The main difficulty in arranging long period secondment of a senior academic has been the problem of replacing his role in the university department while he was away. Suppose a reader is seconded to an overseas university for five years as a professor. If he is replaced at home by another reader, then, when the first man returns to his readership, there will be two readers on the staff, not one. So this procedure effectively earmarks one additional readership to the department concerned at the end of the five years. In an expanding university, this might be hard to justify; in a static one, it would be almost impossible.

Another method, which avoids this difficulty, and which is most easily applicable to fairly large university departments—particularly perhaps to large science and mathematics departments—is simply to use the salary saved to replace the teaching and administrative role of the absent senior member of the staff by one or more temporary appointments at a junior level.

The essential steps in making such an arrangement are that the university concerned must be willing to give long period deferment, up to say, five years, and the university department must be willing to use the salary saved to make suitable short period appointments. This procedure has already been put in operation. London University has given one of its readers leave of absence without pay for up to five years to fill a chair at an overseas university. He is free to return at any intervening year, if circumstances were to make that his wish, and while abroad his name remains on the departmental list and college calendar as "seconded to University X." If at the end of the five years the overseas university wanted to retain his services for life he would be free to accept; he would then resign from his home university. This procedure appears to offer great advantages particularly because it imposes no financial burden on the home university and because it is flexible in operation, and only necessitates relatively minor administrative changes within a large department.

The secretary of the IUC has told me that he thinks that if this method were to be widely adopted in British universities it would greatly ease the task of his council of finding the best possible candidates to fill many posts now vacant in overseas universities. At the present time the IUC is attempting to fill over 200 academic vacancies—nearly 40 of them professorships—in 12 university institutions overseas. The position of the British Council is similar, but on a much smaller scale.

An Unbalanced Trade

It is of interest to compare the present 300 or so British academics now in overseas university posts in underdeveloped countries with the 12,000 university teachers now in the British universities. In order to compete with the rise in numbers in the overseas universities as development plans make progress, one might hope that this approximately seven per cent might rise to nearer 10 per cent. The overseas universities will continue to welcome British candidates only if they are at least equal to the best available from elsewhere. As with other exports, Britain must be competitive in quality.

If, in a few years time, five per cent of the British academic staff would be seconded overseas, the change would not involve impossible organizational problems to the departments, as shown by the number of academics who now do go abroad with one year leave of absence. Moreover, any university which has a regular seven year sabbatical leave must be able to compete organizationally, *in principle*, without 13 per cent of its staff.

University Initiative

In small departments there is less flexibility and probably here the institution of supernumerary posts might be necessary. So, in spite of the fact that the secondment scheme from big departments does not involve extra financial resources, a considerable annual sum is probably required to make possible the secondment of staff from the universities as a whole. Presumably this in the future will come through the Department of Technical Cooperation.

If able university staff are to be attracted to periods of overseas service, they should be able to carry on their own research. In some cases the local universities can produce what is required, but in many cases they cannot. In England we have found the importance of having money for special research available direct to the research worker from an outside body. It is satisfactory to note that funds from the Research Grants Committee of the Department of Scientific and Industrial Research are available to British subjects on secondment to Commonwealth countries from permanent posts in this country. On the other hand, such grants are not available to British subjects overseas on permanent appointments. I hope that the Department of Technical Cooperation will remove this anomaly.

If Britain and the other affluent members of the Commonwealth are to play their part in the development of university education in the now poor countries of the world, two things are vital: first, it is important that the governing bodies and senates of the universities work out administrative arrangements for seconding members of their staff, and encourage the use of this machinery; then I would like to see growing up among the academic staff of our universities, both senior and junior, a greater readiness to envisage working overseas for a period of their career. Today, overseas service of all kinds, as a contribution which the affluent West can make to the growth and prosperity of the newly developing nations, is news; President Kennedy's Peace Corps is a much publicized example, but many other important schemes are in operation in this country or elsewhere. There is a desperate need in the developing countries for all types of trained people, particularly in the technical fields. National schemes must be worked out to insure their supply. This will cost a lot of money and must be accepted as part of our national obligation to give generous aid to these countries.

How many academic pundits have bewailed—in my view falsely—the alleged lack of initiative of the modern generation, and the undue reliance on government action. Here is a chance for the academic world as a whole to show that much can be done without waiting on government initiative.

Population Survival

PETER A. MOLDAUER

THE ONLY RELIABLE safety from nuclear destruction lies in effective international control of nuclear weapons, and the achievement of this end must be the most important concern of our age. But no quick attainment of this goal is in sight and in the meantime the danger of a nuclear catastrophe increases with passing time. It is therefore appropriate to be informed as precisely as possible on the nature of the dangers and measures that can be taken to minimize them.

Even a cursory knowledge of the effects of nuclear weapons and a minimum of imagination suffice to convince one that a determined nuclear attack against the United States could effectively destroy our economy, our social and political institutions, our entire way of life. Any protective measures sufficiently far-reaching to attempt to avoid this outcome would in themselves go far toward producing the same result. We therefore consider here only the problem of population survival under a large-scale attack against the United States with multi-megaton nuclear weapons, and protective measures which would cost less than present annual U.S. defense expenditures. Long-range problems of survival and recovery are not discussed. The discussion is based primarily on information contained in the 1957 edition of the Atomic Energy Commission's *The Effects of Nuclear Weapons*.

The effects of multi-megaton nuclear explosions are blast, heat radiation, and radioactive fallout. From the point of view of survival, the most damaging are the severe blast effects occurring within several miles of an explosion. Fires resulting from heat radiation and extending over areas some tens of miles in all directions from an explosion would be responsible for a major part of the property damage and would add complications to the survival problem. Severe radioactive fallout could cover large regions extending from the area immediately surrounding an explosion to several hundreds of miles downwind.

Presumably an attack against the United States would be aimed at large metropolitan population centers in addition to military targets. Clearly the survival problem in the large target cities would differ from the survival problem in the surrounding suburban areas which, in turn, would differ from the problem in the more distant rural areas and towns. Since the population of the United States is divided roughly equally among these three types of areas, it is appropriate to give equal consideration to the hazards facing each.

Radioactive Fallout

Multi-megaton nuclear weapons derive their explosive energy yield partly from fusion and partly from fission. Highly radioactive fission products are produced in proportion to the fission yield of the weapon. Amounts of fission products are specified by the number of kilotons of fission yield required to produce them. A one megaton fission yield explosion produces 1000 kilotons —one megaton—of fission products. These fission products are carried into the upper atmosphere inside the mushroom cloud. In an air burst the fission products are very finely divided and drop back to earth slowly during many months and years over large portions of the globe. They are then devoid of short term effects on life or health. However, if the fireball of the explosion touches ground, small droplets of molten earth are sucked into the mushroom cloud. These droplets trap some of the fission products, cool, solidify, and drop back to earth within a few hours, spreading over an area around and downwind of the point of the explosion.

Perhaps half of the fission products produced in a ground level burst come down in this nearby fallout. The hazard due to radioactivity at any given place depends on the contamination of the ground as measured in kilotons of fission products deposited per square mile of ground area. As an indication of the probable upper limit of contamination of the ground, one might take the average contamination in the mushroom cloud of a pure fission bomb. Table 1 shows cloud radii and resulting average cloud contaminations for several yields of pure fission explosions. On the ground the contamination would generally be much less, but might exceed the values given in table 1 at isolated "hot spots" and very close to the point of the explosion. Table 1 could

Table 1

Mushroom Cloud Contamination

Fission Yield (MT)	Radius (Miles)	Contamination (KT/sq. mi.)
1	10	3.2
20	34	5.5
50	50	6.4
100	65	7.6

Table 2

Directional Correction Factors

Direction to target	N	NW	W	SW
Correction factor	0.4	1.8	4.0	1.6
Direction to target	S	SE	E	NE
Correction factor	0.1	0	0	0.1

Adapted from B. Ratner, "Winds and Fallout, a Climatological Appraisal," U.S. Weather Bureau, 1955.

Table 3

Contamination Near Blast Areas

yield	*5 miles*	*10 miles*	*20 miles*
20 MT	1.5	.4	.07
50 MT	3.0	.9	.2
100 MT	5.0	2.0	.5

Immediate, close-in fallout due to pure fission ground burst. Fission product contamination given in kilotons per square mile.

be interpreted as the average contamination on the area under the mushroom cloud in the extremely unlikely event of no winds everywhere from ground level to the upper atmosphere. Winds have the effect of spreading the fission products over wider areas than the cloud size, thus reducing the average contamination but increasing the affected area. The area within which the average contamination exceeds any specified amount has roughly the shape of a long ellipse lying downwind from the point of the explosion. The actual shape, size, and direction of this pattern would depend on the precise pattern of wind velocities and directions, which is too variable for the definite prediction of fallout at a specified place. However, knowing the distribution of wind velocities and directions, one can find the probability that radioactive contamination at a given place would exceed a specified value. The curves in figure 1 show how this probability varies with distance from the point of a single explosion for several different severities of contamination. Scales are given for use with pure fission yields of one, 20, and 100 megatons and average wind velocities of 15 and 30 miles per hour. If only half of the yield were due to fission one would use the scale corresponding to the total yield, but reduce the kilotons per square mile value of each curve by one-half. Figure 1 assumes that all wind directions are equally likely. Since westerly winds actually predominate in the upper atmosphere, the probabilities of figure 1 must be multiplied by a factor depending upon the direction to the target area where the explosion occurred. Typical directional correction factors for much of the United States are listed in table 2. Thus to obtain fallout contamination probabilities due to an explosion to the north, probabilities from figure 1 are multiplied by 0.4. In addition to the wind-transported fallout, serious contamination would be expected in all directions close to the point of the burst in rough amounts as given in table 3.

Since a nuclear attack would certainly not be limited to a single bomb over a single target, a realistic appraisal of the contamination hazard at any given place requires the addition of the probabilities of figure 1 due to all possible targets affecting the area and the possible addition of contamination figures from table 3.

Fallout affects life and health principally through body damage produced by the penetrating gamma rays emitted by the fission products. While even relatively small gamma ray doses can have delayed effects on health and produce genetic damage, the primary concern in case of nuclear attack would be the massive gamma ray doses produced by the fallout contamination levels discussed above. Doses in excess of 100 roentgens accumulated within a few weeks may produce radiation sickness. Absorption of doses greater than 200 roentgens may lead to death. Death becomes a virtual certainty when doses exceed 700 roentgens.

If a person were fully exposed, in an open area contaminated by fallout produced in a nuclear explosion two weeks previously, he would absorb a radiation dose of approximately one roentgen for each hour of exposure for each kiloton per square mile contaminating the vicinity. In the early hours after the explosion, according to R. E. Lapp, the greatest dose rate may be as high as 2000 or 3000 roentgens per hour for each kiloton per square mile, depending partly on how early the fallout is deposited and partly on what the correct method for making such calculations is. (Fallout may be deposited between half an hour and 12 hours after an explosion; its arrival time at large distances is determined mainly by the wind velocity.) At times later than two weeks after an explosion, the dose rate decreases to ever smaller fractions of a roentgen per hour for each kiloton per square mile of contamination. The total radiation dose accumulated by persons in the open during the first two weeks after an explosion may be estimated at between 3000 and 6000 roentgens for each kiloton per square mile, again depending on arrival time and calculation method. The dose accumulated during the remainder of the first year has been variously estimated at between 420 and 900 roentgens per kiloton per square mile.

In view of the probable fission product contaminations given in figure 1 and table 3, it is clear that survival in many areas under nuclear attack could be made possible only by protective fallout shelters. In order to put shelter requirements on as precise a basis as possible, we shall attempt to define for each level of fallout contamination a minimum shelter protection factor (or dose reduction factor inside the shelter as compared to outside). To do this we make the following assumptions: The accumulated dose in the open is 5000 roentgens per kiloton per square mile for the first two weeks; the accumulated dose received throughout the remainder of the first year (taking into account incidental protection) is 300 roentgens per kiloton per square mile; and shelter occupancy for longer than two weeks is of doubtful psychological feasibility and should be avoided. To these assumptions we add the requirement that accumulated radiation doses should be kept below 100 roentgens for the first two weeks and below 200 roentgens for the entire first year after an attack.

It is clear that for contaminations greater than two-thirds of a kiloton per square mile the second requirement could be met only by undertaking either decontamination or by evacuation to less contaminated areas at the end of two weeks. Either of these possibilities could be feasible for contaminations up to 10 kilotons per square mile or higher, provided no appreciable dose had been accumulated during the first two weeks, and provided that good communication and effective social organization prevailed. Such requirements could be met by community shelters with protection factors of between 1000 and 10,000. Contaminations in excess of 20 kilotons per square mile probably could not be coped with under the above assumptions. The minimum shelter protection factors obtained by applying the above assumptions and requirements are plotted in figure 2 for various levels of contamination. Reasonable variations in the above assumptions are likely to change the resulting minimum protection factors by at most a factor of two.

Minimum Protection Factors

The estimates of probable fission product contamination given in figure 1 and table 3 can be used with figure 2 to establish probable minimum shelter protection factors at any given place, for any specified attack. To find the probability that a shelter protection factor of, say 100, would not be adequate at a certain place, one adds the probabilities that the contamination there will exceed .57 kilotons per square mile due to each of the weapons used in the attack, using figure 1 and table 3 if relevant. If for example this turned out to be 63 per cent, then the probability that a protection factor of 100 would be adequate would be 37 per cent. As examples, several such calculations have been carried out for an assumed attack in which each urbanized area with a population of at least 100,000 is hit with ground level fission bursts of one megaton yield per 100,000 population. Additional bombs are assumed for military

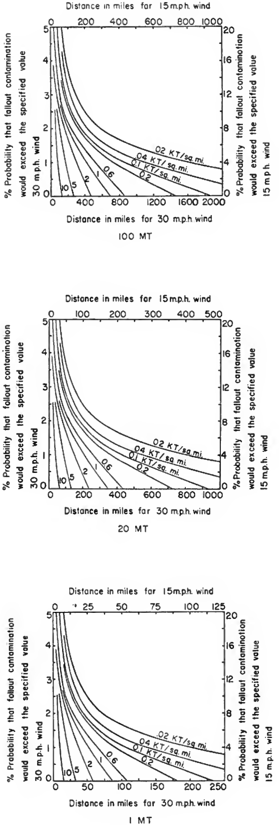


Figure 1. Probable fallout contamination. The curves are based on idealized fallout patterns and scaling rules in *Effects of Nuclear Weapons.*

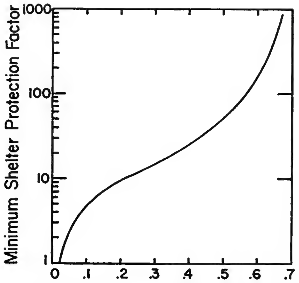


Figure 2. Dependence of minimum protection factor on contamination.

and important industrial and communications targets to bring the fission yield of all bombs in the attack to between 2000 and 3000 megatons—accounted a reasonable attack level at Congressional civil defense hearings, August, 1961. These are very severe assumptions which aggravate the fallout problem because of the wide geographical distribution of targets. The calculations have been made for two average wind velocities, 15, and 30 miles per hour and for two places well surrounded by attack targets. One is the suburban area of Naperville, some 20 to 30 miles west of Chicago, which is assumed to receive 0.1 kiloton per square mile from an attack on Chicago, if the wind does not blow from the east. The other place studied is Kingston, in the middle Hudson valley between New York and Albany. The results, showing probabilities that minimum required shelter protection factors would, under the stated assumptions, lie in the ranges 1, 1–10, 10–100, 100–1000, 1000 or greater, are shown in figure 3. The precise percentage values given are, of course, not very meaningful. What is meaningful is that in all four cases, despite considerable differences in target patterns and wind conditions, substantial probability values are obtained for all ranges of fallout severity varying from light fallout requiring protection factors of ten or less, to very heavy contamination requiring shelters with protection factors of 1000 or greater. These conclusions also remain valid within very wide limits of severity of the assumed attack. The geographical distribution of targets appears to affect contamination probabilities much more strongly than attack severity, as determined by the total yield. The greatest risks would of course apply to places downwind from likely targets. Thus some 50 miles east of a target area the probability that maximum protection shelters would be required for fallout from one 100 megaton explosion might be as high as 50 per cent.

Fire and Blast

In the areas immediately surrounding a multi-megaton nuclear explosion, the problems of fallout would be overshadowed by the heat and blast effects of the bomb. These would extend to appreciably greater distances in the case of high altitude air bursts than for surface bursts. While the former would create almost no fallout problem, the possibility of attacks employing both types of explosion cannot be excluded.

Besides burning exposed persons, the heat radiated from the fireball of the explosion could ignite combustible materials at very large distances (blast damage is another possible source of fires). The fireball has a temperature of several thousand degrees, and continues to radiate intense light and heat for about 10 seconds in the case of a 20 megaton burst and about half a minute for a 100 megaton burst. On a clear day a high altitude 20 megaton burst would deliver up to five calories per square centimeter to surfaces 45 miles away. A 100 megaton explosion would deliver the same heat intensity to a distance of 100 miles. This would be sufficient to ignite crumpled newspapers, dirty rags and other trash. It would also produce first degree burns in skin exposed for the whole radiation period. At 25 miles from a 20 megaton burst and 60 miles from a 100 megaton burst, the heat intensity would be 15 calories per square centimeter, which could ignite dry leaves and vegetable matter, as well as curtains, window shades, cardboard, and cotton cloth, and could produce third degree skin burns. Wooden houses would be charred as far as 20 miles from a 20 megaton burst and up to 45 miles from a 100 megaton burst, but are not likely to be set afire directly. The maximum distances for these effects would be much reduced by clouds, haze, and smoke. Only surfaces in direct line of sight of the fireball of a low altitude burst would be affected. While the number of ignition points could be minimized by such measures as removal of combustibles, and use of aluminized window shades, it is clear that fires would be started over areas of thousands of square miles by each weapon. There has been no experience with such widespread fires and the phenomena that might arise may be difficult to predict. However, it must be expected that under some conditions the fires would coalesce into mass fires of the type that occurred in World War II. In urban areas this requires a 20 per cent building density extending over an area of at least a square mile, according to A. Broido. (BULLETIN 1960, p. 409). Such fires could effectively destroy any city. The principal survival problems in such an area would be thermal insulation and an air supply for the many hours during which the fire might rage.

The sharp pressure increases and violent winds produced by the explosion's shock wave are termed blast phenomena. Table 4 lists the maximum distances from 20 and 100 megaton air blasts at which certain blast overpressures and wind velocities could occur, together with typical types of damages. Table 5 shows the maximum sizes of the areas affected by various severities of blast from single 20 and 100 megaton blasts, together with the percentages of the 200 square mile area of Chicago which these areas represent. Clearly, in addition to fire, blast from a single such weapon could effectively destroy a large city.

The principal hazards to life from blast come from falling and flying debris, and the possibility of people being picked up and carried by the high winds. Also, overpressures of around 10 pounds per square inch can rupture eardrums and at 80 pounds per square inch overpressure direct blast injuries may occur.

Shelters

Principal protection characteristics and costs of five types of shelter are listed in table 6. The limited fallout protection factors of basements and basement shelters in single family houses, though capable of providing important protection in light fallout areas, would still expose people to grave risks in almost all parts of the country, as indicated by figure 3. In areas of substantial blast and fire risk, basement shelters would clearly be very hazardous. Structural modification to provide the needed protection might be feasible. Swedish experi-

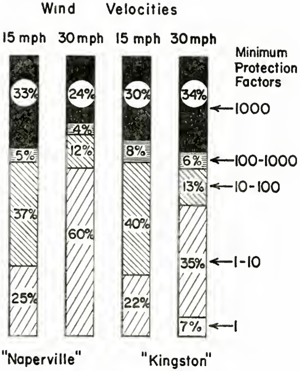


Figure 3. The length of each bar gives probability that minimum protection factor lies in given range.

Table 4. Range of Blast Effects

overpressure (psi)	*wind velocity (mph)*	*damage*	*maximum ranges (miles)* 20 MT	100 MT
0.5	20	windows, doors shattered	40	75
2	70	structural damage to frame houses	18	32
5	160	collapse of frame houses	10	18
8	250	collapse of brick apartment buildings	8	13
*30	670		3	5
*100	over 1000		1.8	3.1

Blast effect given for air bursts. Starred figures are ground bursts; at distances of less than 10 miles from an explosion, these are more severe.

Table 5. Areas Affected by Blast

	20 megaton	
blast severity	*sq. mi. area*	*% Chicago area*
crater	0.75	——
100 psi	10	5%
35 psi	24	12%
10 psi	112	55%

	100 megaton	
	sq. mi. area	*% Chicago area*
crater	1.75	——
100 psi	30	15%
35 psi	71	35%
10 psi	195	~100%

ence in providing community shelters including blast and fire protection features in most new construction there may be of value.

In specially constructed steel or concrete underground shelters, high fallout protection factors are relatively easy to obtain since a 33 inch thick earth cover provides a protection factor of 1000, and each additional 3.5 inches of earth doubles the protection factor. However, it is felt that a population dispersed in family shelters of this type might have difficulty coping with the long-lasting radiation problem in very heavily contaminated areas. Fire hazard may be minimized by locating such shelters away from combustibles where possible. For protection against the effects of mass fires such shelters would have to be closed against the outside air for prolonged periods to prevent carbon monoxide poisoning. The cost of providing oxygen and CO_2 removal for 24 hours is about $5 per person in community shelters and somewhat higher in family shelters, according to U.S. Naval Radiological Defense Laboratory studies. A three-foot earth cover provides sufficient heat insulation.

Blast protection is worthless without sufficient warning time for people to get into shelters before an explosion. Systems to provide quick warning to the civilian population against ICBM attack are being developed. Their adequacy for all methods of weapon delivery may be debatable. The shallow underground shelters discussed here can be constructed to withstand overpressures of up to 100 pounds per square inch. At shorter distances from the point of a surface burst, rapidly mounting blast pressures would require deeper shelters. In addition, the 100 pounds per square inch overpressure range corresponds roughly to the distance within which radiation doses due to the very penetrating prompt gamma radiation become large. A three-foot earth cover provides a protection factor of only about 20 against this radiation. The much deeper shelters required for survival within the 100 pounds per square inch range would presumably cost much more and pose serious difficulties to sufficiently rapid entry.

The cost estimates in table 6 are based on the detailed shelter descriptions and cost estimates given by the Naval Radiological Defense Laboratory, and by the Lawrence Radiation Laboratory (report 6654, 1961), as well as spot checks of costs of several items in the Chicago area. Land acquisition costs are not included. Community shelter costs could be further reduced by grouping together several shelter units.

On this basis a total investment of $30 billion in shelters might save some 40 to 80 million lives in the type of attack considered. However an equal or greater number of lives would probably be lost in the intense blast and fallout areas. Shelters could reduce somewhat the disaster of nuclear war but they are no cure. The central problem remains the elimination of the possibility of nuclear war. What actual bearing a shelter policy might have on *that* problem is far more difficult to assess with certainty than the effect of shelters in the event of an attack. But since the possibility of an attack cannot be excluded with great confidence, an effective shelter program merits serious consideration.

Table 6. Shelter Characteristics

description	*fallout radiation protection factor*	*blast resistance*	*mass fire protection*	*approximate minimum cost per person*
Basement of single family house	10	2–5 psi	none	$35
concrete block basement shelter in family house	100	2–5 psi	none	$70*
community shelter in reinforced concrete building basement	1000	10 psi	none	$50
family underground shelter	above 1000	10 psi	none 24 hours	$250 $270
100 person community underground shelter	above 1000	10 psi 35 psi 100 psi	24 hours 24 hours 24 hours	$150† $165† $200†

Cost figures include all equipment and supplies for two week shelter occupancy.

* *cost of materials only*

† *costs include power generation*
(family shelter costs based on 5-person shelters)

Heroes of Our Time

THE WORLD has a new set of heroes whose fame extends far beyond their native countries. They are called cosmonauts in Russia and astronauts in America—Gagarin, Titov, Glenn. (In justice, Shepard and Grissholm should be added to this list, since their flights into the stratosphere, however brief, included the most dangerous moments of orbital flight—the launching and the descent back to earth.)

The three who have acquired fame—Gagarin, Titov, and Glenn—are strikingly similar in character and background. They are bright, intelligent, well bred and well educated men, self-disciplined, with a clear purpose in life. They are good family men, with attractive wives and children. James Reston, in the *New York Times,* has pointed out the contrast between these new heroic examples to be followed by American youth, and the restless, neurotic heroes of television and film. John Glenn, and probably other American astronauts as well, are faithful churchgoers; Gagarin and Titov are good communists. Far be it from me to equate religion with the secular creed of communism, but both connote conformism to the approved national attitude. Not so long ago, in a Gallup poll, Americans were asked whether they would consider a Negro, a Jew, a socialist, a communist, or an atheist, as a possible president of the United States. The atheist fared worst of all—despite the fact that one of the most illustrious American presidents, Jefferson, was very close to being one. Churchgoing is in today's America a criterion of good citizenship, of unquestioned acceptance of certain general principles of human existence which have become associated in the minds of a vast majority of Americans with the American way of life. The Supreme Court may have quashed the Maryland statutes which barred atheists from occupying any state position, but in our time the reference to God has been introduced into the pledge of allegiance to the flag without much opposition.

At the same time, in the Soviet Union, being a communist has ceased to be a fighting creed, and has become a matter of good citizenship, as defined by the communist state—leadership in youth organizations, volunteering for community activities, good scholarship and uncritical commitment to state policy.

The Gagarins, the Titovs, the Glenns, well deserve their status of world heroes; but in their achievements they were servants of their states and of the societies which produced them. Gagarin and Titov have become the best Soviet ambassadors at large, living advertisements for the advantages of the communist system and the wisdom of communist leadership. Glenn is bound to become a similar ambassador of good will, representing to the world the achievements of free American society.

None of the three heroes is an originator or creator. They are typical of a whole generation of heroes of our time—drivers of race cars, fliers of fighter planes, test pilots. They are daring handlers of machines designed by the genius of others. Typically the names of the builders remain unknown. They are large teams in which no one is singled out in the public mind. The builders of *Friendship VII* are almost as anonymous as the builders of *Vostok I.* The name of the German constructor, Wernher von Braun, was singled out for a short time in the American public mind, but has already been submerged in the large family of designers and engineers working for the U.S. space program.

And truly, are they the creators of the space ships? Or are these the theoreticians, the professors of aerodynamics and ballistics, whose names are hardly known to the public? Mstislav Keldysh, the new president of the Soviet Academy of Sciences, is one of them, but we were never even told whether his work was directly related to the development of the first *Sputnik* and its sucessors.

The clean-cut, sympathetic family men, the astronauts and the cosmonauts, resemble each other closely, whether they come from America or from Russia. As other parts of the world enter the adventure of space exploration, they are likely to produce similar men who have been found most likely to have the steadiness, the ability to act wisely, and even the capacity to relax under the trying conditions of the adventure in space. Left to themselves, it would be easy to imagine Titov as a member of the American group of astronauts, or Glenn as one of the Soviet cosmonauts.

These men could probably qualify as members of a new worldwide brotherhood. I listened in Moscow to an interview with Titov soon after his flight, as well as to the interview with Glenn after his return from space, and the similarity between the two men was striking. And yet these heroes serve, faithfully and intelligently, two political powers that face each other with deep enmity and hope for the collapse of each other. It is easy to imagine the same type of man carrying, if so ordered, megaton nuclear bombs to obliterate Moscow or to incinerate New York. These new world heroes of the age of science are obedient servants of prescientific national states. I read once, I do not remember where, a novel describing the ultimate revolt of flyers of all countries who refused to continue slaughtering innocent people from the air and formed an international government of the air age. But chauffeurs and pilots are even less likely to rebel against those who own the machines they are driving or flying than the scientists and engineers who discover the laws on which these machines are based, and build them at the bidding of their governments.

Scientists, too, form a single fraternity, and engineers and technologists the world over are similar in their attitudes and outlooks—even if they are not so accustomed to worldwide cooperation as scientists. They are all potential useful citizens of a peaceful united world, as are the test pilots and the astronauts, but tradition keeps them all subservient to the power interests of the separate states. They serve these states in constructive pioneering work and exploration, as well as in the development and use of new weapons of man's destruction.

The scientific revolution of our time has made national states obsolete, whether they are based on race, tradition, creed, or ideology; but before mankind has realized this obsolescence, this revolution has provided the leaders of the different states with technical facilities sufficient to destroy their own societies, and to drag all mankind down into obliteration with them. It has given man a source of energy sufficient to produce an adequate standard of living for all, or to incinerate the largest city in a single explosion. It has given man vehicles which could be used to explore the universe far beyond the dreams of any preceding generation, or to carry megaton bombs from one end of the earth to another with the precision of an archer hitting a target at fifty yards. It has developed men who are ready to do both. These are the heroes of our time—the Gagarins, Titovs, Glenns, and the many others following in their footsteps. Societies are as yet only dimly aware that they must use these men (and their machines) for a common effort on behalf of humanity as a whole, and not for their internecine fights. The exchange of telegrams between Khrushchev and Kennedy after Glenn's flight, both agreeing to the desirability of international collaboration in space exploration, are good words; but are the two societies ready to follow them with actions? In 1961, I wrote in the Bulletin that a Russian and an American astronaut flying together toward some cosmic objective would do more for the mutual understanding of the two nations than could years of diplomatic wrangling. This day seems a little less impossible now than it was a year ago. —ER

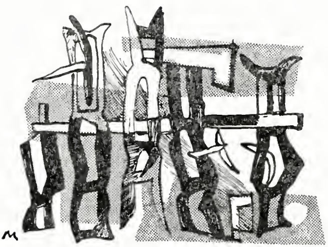
The Politics of the Nervous System

THE ARTICLE by Dr. E. James Lieberman, entitled "Psychochemicals as Weapons" (January, 1962 Bulletin), could lead to serious confusion in the minds of a credulous public and of a credulous military. The author seems to be moved by admirable democratic sentiments, but he has mixed together an astonishing combination of psychiatric folklore and chemical warfare fantasy. The results are misleading.

The so-called "psychotropic weapons" emphasized in this article are lysergic acid diethyamide (LSD), mescaline (the synthetic of the "divine peyote cactus"), and psilocybine (the synthetic of the sacred mushroom of Mexico). The author, a psychiatrist, warns that "catastrophic damage that would be neither reversible nor humane" might follow the ingestion of these drugs.

Dr. Lieberman has presented one of the many sharply divergent viewpoints about the interpretation and application of these drugs. Many psychiatrists believe that LSD, mescaline, and psilocybine produce psychiatric symptoms—anxiety, depression, detachment, confusion, suspicion, psychosis. Many other investigators have come to the conclusion that these symptoms exist mainly in the mind and eye of the psychiatrist, and that conscious-expanding chemicals, far from being dangerous weapons, may produce dramatic changes in personality leading to unprecedented peace, sanity, and happiness.

Perhaps it depends on what you are trained to look for. Most psychiatrists who have experimented with such conscious-affecting drugs report danger. Most non-psychiatrists see these drugs as great benefactors of mankind. Included in the latter group are Albert Hoffman, the brilliant biochemist who first synthesized LSD and psilocybine; Alan Watts, author and philosopher; Robert S. de Ropp, biochemist; Aldous Huxley, novelist and philosopher; and the great American psychologist and philosopher, William James. Also included among those who hail the humanistic



promise of consciousness-expanding drugs are a few psychiatrists who have seen beyond psychopathology to the adaptive potential of the human brain.

So much for the controversial. Research and not words will resolve these issues. But let us look next at the secure knowledge which exists concerning mescaline, LSD, and psilocybine. What are these substances? Sacramental foods? Devilish weapons? Wonder medicines?

It is easier to say what they are not. They are not addictive, nor sedative, nor intoxicating. There is no evidence for any lasting and very few transient physical effects. Everyone agrees on one factor—they dramatically alter consciousness and expand awareness.

There is a second generally shared conclusion. Set and suggestibility, expectation and emotional atmosphere account for almost all of the specificity of reaction. If the drug-giver is supportive, open, relaxed, then the results will usually be positive, educational, dramatically insightful. If, on the other hand, the drug-giver is secretive, depersonalized, himself fearful of the drug, then the reactions will probably be anxious and unpleasant.

As members of a research project studying the effects and application of consciousness-expanding drugs, we have had the opportunity during the last 18 months of observing the behavioral and phenomenological reactions of over 300 subjects. A glance at some of our results suggests that the military applications of consciousness-expanding drugs may be limited. Ninety-one per cent of the Americans who have participated in our research report pleasant, inspirational experiences. Even with no attempt to be therapeutic, and with only one ingestion, over 60 per cent of our subjects report subsequent life changes for the better.

During the past 12 months we have used these drugs for rehabilitation purposes in a maximum security prison. During more than 100 individual ingestions with hardened criminals we have witnessed dramatic insight and behavior change reactions.

Like any product of our advanced technology, the consciousness-expanding drugs can be used to manipulate, to dominate, to frighten or to benefit mankind. A hypodermic syringe of LSD or Salk vaccine in the hands of an enemy can become a frightening weapon. However, the greatest enemies of mankind are ignorance and fear. In the hands of the unfriendly, these weapons—ignorance and fear—can paralyze and destroy.

What are the protections? Accurate information, openly shared, and calm, courageous response to the evidence. Psychiatrists and physicians on whom Dr. Lieberman calls for rescue from danger, perhaps imaginary, can help to the extent they are collaborative, open, fearless with their fellow men. If the American people are frightened by psychopathological obsessions, psychiatric superstitions, and ill-kept chemical warfare secrets, they can be hurt. We are least vulnerable and strongest when we are well-informed. Facts are the defense against any weapon, and particularly the psychological weapons of fear and helplessness.

The facts about consciousness-expanding substances are not all in yet, but some things are clear. Physiologically these substances act mainly on the brain stem, disinhibiting certain regulating, selecting, screening, and controlling mechanisms that constantly guide our perception and thinking. The higher, conscious centers are free temporarily from these artificial restrictions. Behaviorally the main effect of these substances is relaxation. Most of our subjects are very happy just to sit and enjoy the world. There is much less talking, much less superficial movement or conversation. Let us be clear, almost all of our subjects could function very adequately if called on. They choose to relax. Psychologically these amazing substances expand your awareness, they open your mind. The kaleidoscopic and complex world that has always been there, the powerful sensations from every part of your body and the unusual connections of thoughts and feelings that are normally ignored come dramatically into consciousness.

Of course these experiences can be frightening. If you are not prepared, if you do not know what is happening to you and your brain, if you are struggling to maintain complete verbal control over your senses and your awareness, you will certainly be frightened and angry. But if you are prepared, if you know what kind of a chemical you have taken and what to expect (which most subjects participating in psychiatric research with these substances do not), if you do relax, then the experience can be wonderful, enlightening, and life-changing. If an enemy does drop LSD in the water supply and if you are accurately informed and prepared then you have two choices. If you have the time and inclination you should sit back and enjoy the most exciting educational experience of your life (you might be forever grateful to the saboteur). If you don't have the time or the inclination for this pleasant and insightful experience, then swallow a tranquilizer, which is a good antidote, and you'll be back to the prosaic reality. Tomorrow the drugs and the counterdrugs may be different, but the prescription is the same.

If an enemy introduced a consciousness-expanding drug into a military command center, our leaders—if they are accurately informed and experienced about the potentials of expanded awareness—might find that men in certain key positions could function better. In fact, we must assume that these substances are now being used by our space agency for the preparation of astronauts, who will certainly undergo altered states of consciousness in space exploration.

Your brain is your own. Intelligent, open collaboration can expand your mind—with words and with drugs. Only ignorance and misinformation can allow someone else to control it—with their own words or with their drugs or with their imaginary fears.

TIMOTHY LEARY
GEORGE LITWIN
MICHAEL HOLLINGSHEAD
GUNTHER WEIL
RICHARD ALPERT

Psychopathology of Nuclear War

DONALD N. MICHAEL

WE ARE a long way from being able to relate precisely the behavior of sick individuals and that of sick —or disorganized—institutions. Even more important, we know almost nothing about the relationship of individual emotional factors in leaders and the amplifying or attenuating effects on their behavior of the institutions in which they operate. Tragically perhaps for the survival of this civilization, the most positive statement we can make is that much research is mandatory on these problems if we are ever to cope with them effectively.

But there are some instances of behavior which are especially striking examples of the strong tendency to distort or ignore fundamental aspects of events and their consequences associated with the context of thermonuclear war. On the face of it, the distortions and oversights are so gross that one can suspect that the individuals and institutions involved are not responding with sufficient attention to reality to be called sane by any standard.

At both ends of the continuum of war-mongering and peace-mongering, there are many people of sound intelligence who bear great social responsibility but who nevertheless have not done sufficient homework to understand the broad nature of the problem of keeping the peace. At one end of the continuum are those who insist on seeing the situation as a logical military power exercise; they willfully ignore the emotional, irrational, individual factors which will affect the direction of history at least as much as the number of warheads. At the other end are those who insist on seeing the situation as one comprised chiefly of the kinds of relationships holding between man and man: *they* willfully ignore the tremendous inertia of socially stable institutions and the constraints on interpersonal relationships set by the needs to compromise political differences and control the power ambitions of individuals within these institutions.

Semi-Real Mass Media

We all live in multiple semi- or pseudo-realities. Certainly those of us who depend on the mass media for our information must recognize that it is impossible to present to the public the only "true" facts. It is impossible because many of the crucial facts are not available to those preparing the mass media. It's impossible because events in themselves frequently do not have the newsy character which would make straightforward reporting compatible with the goals and style of the media. That is, events aren't a series of headlines. Yet we frequently act as if what we are reading or hearing is indeed a true description of what is happening in the world. But semi-reality goes beyond this. For even in the high reaches of the government, both horizontally and vertically in the governmental hierarchy, there are different realities in different offices—as the Cuban fiasco demonstrated. Yet at all levels people and institutions forget their limited access to reality and instead behave in crisis, particularly in crises related to thermonuclear war, as if they were the keepers of truth and reality.

I need hardly add that such feelings of omniscience and possessiveness are not usually considered signs of mental health. And what shall we say about a society so organized —or disorganized—that its citizens can't find out enough about reality to make adequate judgments, even given the emotional stability and maturity to do so?

Overlooked Drawbacks of Deterrence

One of the most dramatic and dangerous areas of selective inattention and repression is in connection with the philosophy of deterrence. Two profoundly important aspects of it are generally overlooked.

First, it is usually argued that, if both sides have relatively invulnerable, overwhelming second-strike capabilities, no one but a madman would choose to initiate a nuclear war. But implicit in the concept of deterrence is the idea of being able to use it as a shield for pushing an adversary to political extremes, safe in the knowledge that as long as he remains sane he will not use his nuclear weapons. However, an enemy could be pushed so hard and into such an inextricable corner that he may well be forced by the nature of his commitments to act regardless of the consequences. Such action may be madness, but if it is madness, it is shared by both those who are pushed and those who do the pushing.

Next, it is argued on the one hand that we must make our second-strike capability invulnerable and, on the other hand, that an enemy initiating a nuclear war would attempt to destroy our second-strike capability. Indeed, this is a major premise in our new civil defense posture in which it is argued that, because the enemy will use his weapons for destroying our second-strike capability, people could survive the fallout in shelters even in some cities, since cities will not necessarily be—indeed are not likely to be—targets.

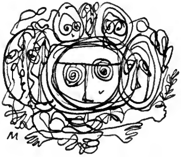
But as time goes on (and it *will* take time to develop a true shelter system), more and more of our second-strike capability will become relatively invulnerable. Rocket-launching submarines, airborne rocket launchers, and perhaps flatcar-based Minuteman rockets present exceedingly difficult targets—so difficult in fact that an enemy could not hope to destroy a significant portion of our retaliatory force before it destroyed them.

And the USSR believes the future is with her, and she can interpret much that happens in the world in support of this thesis. Under what circumstances, then, would she risk destroying that future if she had any alternative to initiating an attack to which we would retaliate with our relatively invulnerable second-strike force?

The chief worry should not be that she would *rationally* calculate an attack, but rather that she would perceive some situation in which we might place her as allowing her no alternative *but* to attack. And we might well place her in such a position if our leaders believe in the effectiveness of our second-strike force and if they are supported by a public bursting with "no negotiation" belligerence, grossly overblown by its belief in the "safety" provided by a shelter system. So cornered, the furious, frustrated, desperate leadership of the USSR would attack this nation, no longer knowing or caring whether they could do sufficient damage to our second-strike capability to protect the viability of their society. In this state of mind they would have no choice—no wish—to do other than smash our cities—all of them—and with them the social fabric which had so harried and driven them. It seems to me perfectly clear that under these frantic circumstances their means for destroying their enemy once and for all would not be by fruitless attacks on an invulnerable second-strike capacity, but by destroying the social fabric of the enemy by smashing his cities.

Nonrational Civil Defense

Let's look more closely at civil defense as the latest example of less than rational behavior with regard to thermonuclear war. It's been argued that under a nominal —i.e., 2000 megaton—attack, we could recover a high level of gross national product in a decade or two. But if one looks at the studies on which these arguments are based, one is overwhelmed with the evidence that recovery could only be accomplished by the most stringent and controlled allocation of human and natural resources. Given likely situations following a major thermonuclear attack, it is clear that democracy is not among those items that survive or can be stockpiled for the post-attack period. It is probably true as well that the Russian form of communism would not survive either. One wonders then what the purpose would be of getting into an all-out nuclear exchange, since presumably countries with sane leaders would not take on a senseless war which would lose for them that which they wanted to preserve through the war. Yet leaders talk about not being afraid to defend their ideals even if it means nuclear war.



But even if we are prepared to give up democracy, present civil defense plans can be seen as little more than a gross repudiation of reality. For example, in the lobby of the Executive Office Building in Washington is a handsome set of designs and models for a school shelter, showing supplies and living areas for teachers and children. To the best of my knowledge, however, these handsome school shelters have not been planned to absorb the people from the surrounding community—parents, non-parents, transients, workers in that area—so many people as to probably crowd that shelter beyond the survival point. Now, who decides how many people can come into the shelter? Who decides how to keep people out of such a shelter? Who decides how the food, medicine, and bunks, are to be rationed? Who will be in charge? The principal, perhaps? It looks good to say we have a shelter for teachers and students, but it is totally unrealistic to assume the shelter is in fact only for them. Yet the evidence is that they are being built and stockpiled and the management planned in this unrealistic way.

Any shelter program is only valuable if people are trained to use it under all likely circumstances. Who then will take the political responsibility of awakening people at 12:00 a.m. on a cold, sleeting January morning to force them to leave their beds and practice taking shelter? After all, it isn't in the interests of the nation to have shelter-taking jeopardized and shelter systems destroyed by people who haven't practiced and who become panicky and disrupted when the attack really does come. Hence, practice must be mandatory, but what Congressman will sign that law? Then too, it's expensive to close down a steel mill, yet if it isn't closed down and shelter-taking practiced, the whole civil defense system becomes a sham. Who will pay business for time lost? Could a citizen sue the community if his leg is broken during a practice exercise? Will the powers of local political patronage be overcome sufficiently so that managerial and organizational positions for the post-attack period can be assigned *now* to those who have the temperament and guts for such jobs? And finally, since there never will be enough shelters for everybody, who is to decide which people are permitted in which shelters under which circumstances? Remember, it isn't enough to have one shelter per person, since people split their time between different areas, and the density of population varies in those areas at various times. These questions have not been asked and answered publicly by those pushing the new civil defense program. One could explain this by pointing to the political unpalatability of the questions. But it is precisely the overbalancing of politics against the ethics and morality of life and death in the thermonuclear age which makes one wonder if the society is not in deep emotional trouble.

The Samson Complex

Lastly, let me share with you a particularly depressing speculation which bothers me and bothers more people in more places than you might think. This is what I call the Samson complex. All of us carry a burden of free-floating guilt. In the United States at least, those who rise to responsible positions of power probably carry more of such a burden than those who do not, because attaining politically powerful positions frequently requires behavior contradictory to the Judeo-Christian tradition. This guilt is easier to live with in a world where one's goals seem to be attainable and where one's values seem viable. But there is a feeling abroad in this nation that somehow our response not only to the Russians but to the world we have made has been inadequate, that our goals seem rootless, that we are a society in search of a faith. And there is a feeling of frustration, of a growing inability to make things go our way. This sense of inadequacy, combined with a sense of guilt, combined with great frustration, could produce an outburst of destructive fury, ostensibly toward an enemy. But in great part this destructive outburst could be motivated by an unconscious effort to annihilate from consciousness—even if it means destroying that consciousness forever—the sense of guilt, of frustration, of inadequacy, which today confronts so many of the political and intellectual leaders of this society. War could be a way to wipe the personal, national, and international slate clean.

We know enough about people as individuals to know they act this way. We don't know enough about individuals acting in and as institutions to know how significant for behavior are threats to the self-image and traditional meanings. We must find out and apply what we find out soon—or there may be no society left, normal or pathological.

FEDERATION OF AMERICAN SCIENTISTS

FAS is a national, nonpartisan organization of more than 2200 scientists concerned with the impact of science on national and international affairs. FAS was formed in 1946 "to meet the increasingly apparent responsibility of scientists in promoting the welfare of mankind and the achievement of a stable world peace." Membership includes persons from all fields of natural and social science, medicine, and engineering —plus a limited number of non-scientists.

DISARMAMENT

FAS has long urged creation of an adequately financed well-staffed government agency to do the research necessary for sound disarmament planning. FAS lobbied actively and effectively for the new Arms Control and Disarmament Agency, and several FAS members occupy key posts in it.

TEST BAN

FAS has sought an international agreement banning nuclear weapons tests, under supervision of an international inspectorate. FAS members have been instrumental in assisting the U.S. government—publicly and privately—in developing creative and useful approaches.

NATO

FAS opposes the transfer of nuclear weapons to NATO control since this would increase the likelihood of accidental war and hamper future deceleration of the arms race. For like reasons, FAS has suggested that the U.S. declare that it will not be the first to use nuclear weapons and make its total national security planning consistent with such a declaration.

CIVIL DEFENSE

FAS has urged official candor and journalistic restraint in describing what shelter programs can and cannot do in various attacks, while asserting that true long-term security lies not in shelter programs but in political settlements.

SCIENTISTS' TRAVEL

FAS has successfully fought U.S. attempts to limit the contacts between American scientists and those from Soviet-bloc nations. Passport and visa regulations should encourage rather than hinder the interchange of scientists and ideas.

RADIATION HAZARDS

FAS, by testimony before Congress and by publication of its own scientific studies, has sought to inform the public of the nature of the radiation hazard and the need for maintaining a balanced perspective in reaching political decisions where the hazard is a relevant consideration.

PERSONNEL SECURITY

While recognizing the necessity for a personnel security program, FAS has vigorously opposed application of irrelevant criteria and arbitrary procedures which merely engender fear and distrust, deadening independence and creativity and striking at the core of our true security.

FAS OFFICERS, 1961–62: Chairman—John B. Toll, Professor of Physics, University of Maryland; *Vice-Chairman*—Peter G. Bergmann, Professor of Physics, Syracuse University; *Secretary*—William C. Davidon, Professor of Physics, Haverford College; *Treasurer*—M. Stanley Livingston, Professor of Phycis, MIT; Donald G. Brennan, Mathematician, Lincoln Laboratory, MIT; W. A. Higinbotham, Division Chief, Brookhaven National Laboratory; Walter Selove, Professor of Physics, University of Pennsylvania; Gary Felsenfeld, National Institutes of Health. (Affiliations listed for identification only.)

Membership Dues

Regular—$7.50 (income below $4500—$4)

Supporting—$10

Patron—$25

Student—$2

FAS Newsletter (10 issues per year; free to members)—$2

Contribution—$____________

Federation of American Scientists
1700 K Street, N.W., Washington 6, D.C.

I wish to support FAS by becoming a

☐ Member ☐ Subscriber ☐ Contributor

Name____________________

Address____________________

____

☐ Please send information on Group Life Insurance of $10,000 available to members at low rates and without medical examination.

Freedom for Science

LEOPOLD INFELD

The word "philosophers" in this article should be understood as "Marxists," according to the translator, Z. Anthony Kruszewski, of the University of Chicago. Professor Infeld's remarks were published late last year in a Warsaw literary weekly, Przeglad Kulturalny, *as part of a continuing discussion in major Polish periodicals by distinguished intellectuals on the concept of expanding freedom within a communist social order. Some argued that his views were too optimistic, but agreed that the trend is toward more freedom.*

SHOULD there be full freedom of discussion in matters concerning science? Or, more concretely, should philosophers who do not know physics participate in discussions between physicists, and even have the decisive voice? Although the answer seems self-evident, it is worthwhile to go back to a period which now seems prehistoric—seven years ago—when the official answer would have been yes.

I would like to recall my experiences during that period. I must admit that I have admired someone almost boundlessly ever since I was 20 years old. This man was Albert Einstein—my teacher and friend.

When I returned to Poland in 1950, full of enthusiasm to build a school of theoretical physics, it turned out that quasi-philosophers, and not physicists themselves, were passing judgment on physicists, their relative value, and their theories. They announced almost unanimously that Einstein was an idealist since his theories were not in agreement with those of Copernicus. And since Copernicus was a world-famous Pole and a Slav, his theories of necessity must be right—now and forever. They did not understand anything of the intricate and difficult equations of the theory of relativity. They would pick on single sentences not expressed in the equations and in them they would see seeming inconsistencies between the Copernican and Einsteinian theories.

My wife told me that she heard, in the office of the Polish Radio Corporation, the opinion that the theory of relativity is idealistic and therefore not scientific. The program director who expressed the opinion was eager to broadcast this fascinating information to America.

During a certain official reception, I happened to speak with a highly placed and exceptionally intelligent person who said: "But Einstein is an idealist and therefore his theories are accepted only in the West." Flushed with anger I answered: "Why do you talk about things you do not know anything about?" He bit his lips and did not say a word, but he never took revenge for my answer.

Depressed because of this generally accepted opinion and other influence of philosophy over science I finally wrote an article in defense of Einstein, for the *Mysl Filozoficzna* (*Philosophical Thought*). I was afraid that the article would not be accepted, but common sense won.

Sometime afterwards the editor of *Mysl Filozoficzna* triumphantly announced that my article had been reprinted by a Soviet periodical. The attacks against Einstein suddenly stopped completely. In the Soviet Union several books were published about the great scientist, Einstein. The book by Einstein and myself was published in Poland and in all the countries of Peoples' Democracy, together with my book about Einstein. A Soviet periodical even reprinted my small book, *My Reminiscences of Einstein*, in which I have recalled all the complications and difficulties connected with my struggle to win respect for the theory of relativity in Poland.

This was not an isolated incident. I remember that a friend of mine read to me an attack, published in a Soviet periodical, against a great Soviet physicist, the late Professor Abram Joffe. Apparently he did not understand the connection between energy and mass. I remember when Einstein and Paul Adrien Dirac, the famed British physicist and mathematician, were branded as physicist-idealists during a debate in the Polish Diet. I remember one more incident of the pressure exerted by philosophy over physics. I recall it with shame because of the role played by certain respected physicists. It concerns the condemnation of Linus Pauling (the same Pauling who was quoted by Gomulka in one of his recent speeches) as the creator of an idealistic theory. This condemnation took place during a meeting of chemists and physicists among whom not one knew anything about or had done research on Pauling's theory. It is interesting that Einstein, Dirac, and Pauling, who were so much attacked, were clearly progressives.

Why do I write about all this? It is because we must not close our eyes to the lunacy of scientists, of which we were simultaneously victims and perpetrators. It is fortunate that it all belongs to the past, even to the prehistoric past. The atmosphere has changed long ago, and not only in Poland. When I talked to the most eminent Soviet physicist two or three years ago, I asked him if there is any pressure exerted now by philosophers over science—he said, there is none. So much about physics. The biologists might have more to say.

I would also like to write something about general liberties. We all obviously understand that liberties cannot be unlimited. We cannot allow open antisemitic propaganda, war agitation, or demonstrations against our system.

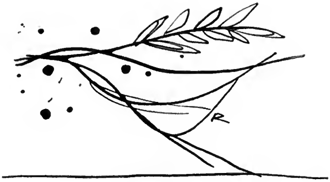
In the cultural sphere, the cinemas are showing excellent films alongside many worthless ones; freedom to select the plays which we can see in the legitimate theater is also somewhat limited. In the field of education there are limitations concerning printing of books. I agree to all this. I agree to the present system of censorship (on condition it is not too strict). I agree even to the overfrequent display of new factories on the TV. But . . . on one condition. The situation of the present movement is not as important as the direction in which we move. I agree to the present state of affairs on the condition that the freedom will increase rather than decrease for our children.

We talk about the competition with the West. That competition can not be strictly on the economic level. It has to be also on the level of liberties, on the level of freedom. In America the Communist Party has been outlawed and the liberties of the so-called "free world" are being limited. As we are convincing our country that, in our circumstances, our system is the best possible one, we have to juxtapose the decrease of liberties in America with the increase of liberties in our country.

Our socialist system will win increasing numbers of followers and win the competition with the capitalist countries only through the simultaneous increase of both the standard of living and liberties.

Disarmament in Middle Europe

GERD BURKHARDT



There are three possible futures for Germany—indefinite continuation of the present division into the Federal Republic of Germany and the German Democratic Republic, a "revolutionary" unification, and an "evolutionary" unification. Few Germans are willing to accept the first alternative, the belief in the second is waning, and various thinkers, among them the author of this article, are searching for possibilities of evolution toward the third. Demilitarization of both parts of Germany, and intensification of commercial and cultural relations between them, appear to all of them as the first step. There are, however, two powerful forces opposing this development. One is the importance of Western Germany for the military strength and viability of NATO, not matched by that of Eastern Germany for the Warsaw military alliance. The other is the trend toward integration of Western Europe—which, too, would lose its strength without Western Germany. Can a compromise be devised between the two desirable aims—demilitarization and unification of Germany on the one hand, and formation of a prosperous and strong Western Europe? Certainly not without a much tighter union and a much stronger common economic and military effort of other nations of Western Europe—in particular, of Britain and France—than seems to be feasible at the present time! An escape from the perpetuation of the present partition of Germany may be impossible without an overall change in the relations between major nations—a liquidation of power politics, which have become obsolete in the atomic age.

THE PROBLEM of Berlin, which in the past few months has reached another crisis, not only represents an immediate threat to world peace, but is also a reflection on the tensions inherent in the present division of Germany into two states. Consequently, any ultimate solution of the precarious situation in Berlin must be seen in the overall context of German reunification. As the two states have gone their separate ways during the past 10 years, economic, social, and political differences between them have become more pronounced, thus continually widening the gap between a people who for centuries have had a strong feeling of national unity.

At present, it would seem that fusion of the two Germanies into one state would be possible only if the existing social order in one state is given up in favor of the other. No doubt an autonomous decision in Germany would show a clear and convincing majority in favor of the Western democratic form of government. However, it is clear from the overriding political realities that a unified Germany belonging to the NATO system would be just as unacceptable to the Soviet Union as a Germany adhering to the Soviet bloc would be to the West. If it is, therefore, unrealistic to hold any illusions about immediately foreseeable prospects for reunification, the alternative of permitting the two parts to become stabilized in their different social systems and hence to become permanently separated is not, to my mind, an acceptable solution of the German problem.

One way out of the present impasse would be to conclude a comprehensive peace treaty with both parts of Germany, as repeatedly urged by Premier Khrushchev, in connection with a regional disarmament agreement in Middle Europe. Proposals for disengagement of the two big power blocs have been made since 1954 by spokesmen for both sides; one calls to mind plans associated with the names of Eden, Gaitskell, and Rapacki, among others. One such plan has been set forth recently by Helmut Schmidt, a member of the Bundestag of the Federal Republic of Germany, in his book *Defense and Retaliation*, published in 1961.

A review of the current military situation in the area indicates a strength of more than 60 divisions of native and Soviet troops in the Warsaw Pact nations (including six native and 20 Soviet divisions in East Germany, 13 divisions in Poland, 14 in Czechoslovakia, and four in Hungary) as against some 20 divisions in the NATO nations of Middle Europe (including five U.S., three British, and two French divisions stationed in West Germany, as well as seven divisions of native forces of West Germany, one of Denmark, two of the Netherlands, and two of Belgium). The numbers, however, may be misleading in view of the superiority of the West in nuclear armaments, as against the greater manpower of the East. The proposed zone of arms limitation comprises the territories of East and West Germany, Poland, Czechoslovakia, and perhaps also of Hungary. The areas of these territories West to East are in the ratio of one to two, while the populations on both sides are roughly equal: about 53 million on the Western side as against some 58 million in the East. In economic and industrial potential the Federal Republic of Germany has a decided superiority over the four states of the Eastern bloc.

Military Limitations

Military limitations must be carried out in such a way as not to upset the balance of power, so that the security of one side will not be threatened. Schmidt's proposal begins by limiting the manpower of the West German Bundeswehr to 300,000 men. The proportion to the respective powers of the other armies should be: to Poland as 3:2; to the German Democratic Republic as 3:1, and to Czechoslovakia likewise 3:1. The ratio of armed forces in the Middle European zone would be 3:4 (West to East), or including Hungary, about 3:4.5. All these troops must be armed exclusively with conventional weapons.

To put into effect such a program of arms limitations requires a workable international system to supervise the strength and type of the admissible weapons. Since such an inspection system would not confront some of the most difficult problems inherent in such schemes, such as the detection of hidden nuclear stockpiles, inspection would be easier and more practicable; indeed, such a system might serve as a model for other, more far reaching international arms control programs. After this first step has been taken, which might be accomplished within one year, it should be followed by the withdrawal of all foreign troops stationed in the zone; the area would then be free from all nuclear weapons. This withdrawal should be accomplished in connection with the conclusion of the peace treaty with Germany, while the peace negotiations could begin right away. The peace treaty should not go into effect before the first step of arms limitation and its attendant system of inspection is completed.

Finally, in order to prevent a rebellious movement within one part of Germany that may attempt to overthrow the existing government, perhaps with material or moral support from the other part, some troops of both the U.S. and the USSR should stay in Germany for some time. In time, however, the military value of their presence may be only symbolic. Eventually they could be replaced by a United Nations police force. Moreover, the treaty should stipulate the possibility of "re-entry" of foreign troops should one of the countries of the zone feel its security threatened.

A number of objections have been made against such an agreement. One frequently heard objection states that the U.S. would withdraw its troops from all of Europe as a result of such "neutralization," causing a serious upset of the balance of power in Europe. Schmidt's military disengagement plan, however, provides for American troops to remain stationed in Europe beyond the Western frontier of Germany, which of course would require the cooperation of the neighboring nations, particularly of France. Objections from the point of view of strategy against diminishing the depth of the strategic area by the exclusion of the Bundesrepublik have been disproved by several military experts. To remove the nuclear weapons presently in possession of the NATO forces in Germany would require some reshuffling in the strategic planning of NATO, but military disadvantages, if any, are surpassed by decisive benefits. These objections, all regarding the disadvantage of the plan for the West, are usually followed by the assertion that the Soviet Union would never agree to it, an assertion that has yet to be proved.

Political Measures

In addition to the purely military aspect, the peace treaty with the two parts of Germany should create a *political* disengagement and stabilization in Middle Europe. It would contain the renunciation by Germany of claims to former German territories beyond the Oder-Neisse line. As a German, I might point out that this renunciation would be painful for all Germans, especially those who had had their homeland there. But the Germans must recognize that the loss of these territories is a consequence of the war initiated by Germany, and they must learn to accept these consequences. If, finally, Germany should succeed in gaining the friendship of its eastern neighbors, in spite of the terrible things that happened in those countries during the Nazi occupation, the loss would be outweighed by the gain.

The peace treaty cannot end overnight the partition of Germany. West Germany should remain a partner in NATO, and East Germany in the Warsaw Pact; forced neutralization of this territory in the face of the existing ideological antagonism would create a dangerous instability. Furthermore, West Germany is too deeply involved in the movement toward overall political and economic integration in Western Europe. The special status of Berlin would be maintained until this city can resume its role as the capital of a reunified Germany in the future. In the meantime it might serve as the residence of the control commission of the demilitarized Middle European zone, or possibly it might be defined as a free city under U.N. administration. Free access in and out of the city from both parts of Germany should be fixed by the treaty.

The treaty should also bind the two German governments to negotiations aimed at reducing the present sharp difference in standard of living and currency, and also to remove the restrictions upon free tourist traffic between East and West Germany; this is to take place within a period of about three to five years after the treaty has been signed. An important consideration is that inhabitants of each part of Germany have friends and relatives living on the other side, and one reason for the problem of East German refugees is the fear of finally being isolated from West Germany. Unrestricted travelling would probably level off the fluctuation of population, after some initial shifting back and forth.

To be sure, these proposals would require extensive contacts between the two governments, and would certainly involve at least *de facto* recognition of the East German government, a step that West Germany has so far been unwilling to take. Eventual replacement of the personalities in the political arena of both sides by new ones, less committed to fixed policy positions, would make beginning negotiations possible, and would help to reduce the present antagonism to a more peaceful competition.

Ultimately the time will come to elect by ballot in East and West an all-German government. At this time there must be a new, drastic reduction of the armed forces in Germany, and both sides will have to withdraw from their present military alliances. Germany, reunified in this way in a disarmed Middle Europe, would no longer constitute a danger to its neighbors. Situated in the midst of Europe it can form a bridge of spiritual exchange between the West and the East, just by living its own way of life.

Scientist as Citizen

As the awareness of the vital importance of science and technology to the modern state grows, increasing numbers of scientists are joining the government in special positions. Who are these scientists who serve their country as citizens? This profile, the first in a series, explores the work of the Science Advisor to the Secretary of State, Walter G. Whitman

A QUIET New Englander became the second well-known scientist to hold the position of Science Advisor to the Secretary of State under a reorganized program. When Walter Gordon Whitman, Chairman of the Chemical Engineering Department of Massachusetts Institute of Technology, succeeded Wallace R. Brode in September 1960, he found the second effort to establish a science office in the State Department well begun with American scientists in nine U.S. embassies abroad and a small team in Washington.

The vicissitudes of the earlier State Department program will be remembered by BULLETIN readers. Established in 1951 in recognition of the fast-growing importance of science in formulating foreign policy, and based on the war time experience of several government agencies operating overseas and on three major studies of the relation of science and government (Bush, Steelman, and Berkner), the program was greeted with warm approval by the scientific community. And when the effort lapsed in 1953 there were widespread expressions of regret.

The man who heads the science office today is doing a patient, solid, spade-work job of integrating and coordinating—integrating the science team within the State Department and with the corps of officers abroad, coordinating the science interests of the State Department with those of the White House, the Department of Defense, the Atomic Energy Commission, and other agencies. Much of this kind of job is done by serving on science policy committees. Mr. Whitman is on the Federal Council for Science and Technology (chaired by Jerome Wiesner, the President's Science Advisor) and is himself chairman of the council's committee on international science. He participates in the staff meetings of the Secretary of State and attends meetings of the President's Science Advisory Committee as one of five observers from government agencies.

It is clear that Mr. Whitman conceives his job as one of advising rather than of leading. He has worked to make the science office increasingly useful as an arm of the State Department. Thus his staff includes Earl B. Sohn, a Foreign Service officer, and Walter M. Rudolph, a State Department officer who has been associated with the science program from the beginning, as well as scientists William C. Salmon, and Eugene G. Kovach. In addition, one of the assistant science officers is a military officer from the Pentagon, a participant in the new program of two year exchanges of selected career men between State and Defense Departments.

To make the science attachés more effective, much has been done to define and clarify the role of these men in relation to embassy staffs, to the scientific communities of the countries to which they have been assigned, and to the goals of U.S. foreign policy. Nine American embassies now have one or more science attachés: London, Paris, Rome, Bonn, Stockholm, New Delhi, Tokyo, Rio de Janeiro, and Buenos Aires. A temporary attaché was assigned to Moscow in the summers of 1960 and 1961, and it is hoped to bring Bern, Tel Aviv, and Karachi into the program soon.

Mr. Whitman comes from Massachusetts where he was born November 30, 1895 in Winthrop. His professional career was largely at Massachusetts Institute of Technology where he took his B.S. and M.S. with a nine year interval in industrial research at Standard of Indiana. He was a member of the faculty in chemical engineering from 1917 to 1925 and its head from 1934 to 1960. It was during leaves of absence from MIT that he received his experience as an administrator. He served on the War Production Board, 1941–45, and was chairman of the Research and

Development Board of the Defense Department, 1951–53. Among other government assignments, perhaps the most important was membership on the General Advisory Committee of the AEC, 1950–56. Mr. Whitman is married, has three children, and seven grandchildren.

It was the 1955 Geneva Conference on the Peaceful Uses of Atomic Energy that made Mr. Whitman known to a wider circle. He was the Secretary-General of that milestone on the road to free scientific communication between East and West, and some of the euphoria of those days will always be associated with him. He became a familiar sight to the delegates as he slipped unobtrusively in and out of technical sessions, press conferences, and lounges, always unhurried, approachable, and relaxed. An atmosphere had been somehow created conducive to unscheduled talk and the establishment of new friendships. Contributing to this atmosphere was a music room containing the best possible high-fidelity equipment and 1,500 records —a gift resulting from Whitman's conviction that music is an unique language of international understanding. It was the only place where press people did not try to get interviews and during 12 hours of the day delegates were to be found there in comfortable chairs, eyes closed or scanning reports. It was an inspired idea.

Laura Fermi reports in *Atoms for the World* that Whitman would gladly have substituted concerts for some of the evening lectures considering the days were so packed with learning, but Academician Skobeltzyn (Soviet physicist and one of the conference's vice-presidents) declared that scientists were at Geneva to work not play, and the lectures stayed on the program!

To his colleagues in Washington, Whitman's achievement to date lies in making the science office a more integral part of the State Department and in creating channels by which scientific knowledge and judgment are more effectively utilized in the administration. To the scientific community at large, a more important result of Whitman's tenure appears to be the liberalizing of official policy in regard to government scientists attending international conferences along with representatives from certain Communist countries. For years the State Department has been reluctant to permit contacts which might imply a weakening of its policy of nonrecognition, but it has applied the policy unevenly. Scientists from the Naval Research Laboratory have attended conferences along with East Germans and mainland Chinese, but in May, 1960 three Public Health Service officers already in Moscow for scientific meetings were not allowed to attend a symposium where Chinese were present.

This distasteful block to free international exchange of scientific information (making it harder, incidentally, for the State Department to recruit first-class scientists for its program) was faced realistically by Whitman. In reply to a direct question from the Federation of American Scientists in October, 1960, he said that while the department did not usually accredit an *official* U.S. government delegation to international conferences at which the attendance of nationals of unrecognized regimes was expected, "this does not, however, preclude government employees from taking part in nongovernmental meetings at government expense without accreditation if the Department of State determines that their participation is in the national interest."

The same shift to a more liberal position can be seen in regard to visas. Mainland Chinese had been invited to send representatives to the Stowe Conferences on Science and World Affairs held in Vermont, September 1961, and although no Chinese came, it was understood that their visa applications would have received equal consideration with other applications. On the other hand, responding to the Berlin crisis, a visa was not granted to a participant from East Germany. The State Department's position was that a request for a visa would be considered on its own merits in the light of the purpose of entry into the United States.

It was said of the 1955 Geneva conference that the United Nations staff enjoyed it more than most conferences because it seemed so clearly to be accomplishing something. In Washington, too, Walt Whitman's quiet way of getting things to run smoothly seems to bring results.

—HCA

new university thought

. . . a journal of fact and opinion . . "put out by a group of young people unashamed to call themselves intellectuals, and concerned by American intellectuals' withdrawal from 'participation in public life'."—The *Times* of London, *Literary Supplement.* 16 September, 1960

announces the publication of

new university news

A monthly news review of interest to students and other young people in the academic and professional world. Contents include reports on the activities of the (Southern) Student Nonviolent Coordinating Committee and full coverage of peace activities. Single copies 10c, subscriptions $1 per year.

in volume II, number 2 of new university thought

- Stock ownership and the control of corporations: part III, *by Don Villarejo*
- Advice to young artists, *by David A. Siquieros*
- Automation and unemployment, *by Richard Ward*
- The ideology of the person, *by Gabriel Breton*

new university thought

5478 South Woodlawn Avenue, Chicago 15, Illinois

Please enter my subscription for

☐ 1 year —$2 **☐ check enclosed**

☐ 2 years—$4 **☐ bill me**

☐ 3 years—$6

Name..........

Address..........

....

new university news

5478 South Woodlawn Avenue, Chicago 15, Illinois

Please enter my subscription for

☐ 1 year —$1 **☐ check enclosed**

☐ 2 years—$2 **☐ bill me**

Name..........

Address..........

....

Books

For the Military Bookshelf

The Common Defense: Strategic Programs in National Politics. By SAMUEL P. HUNTINGTON. New York: Columbia University Press, 1961. Pp. 500. $8.75.

Changing Patterns of Military Politics. SAMUEL P. HUNTINGTON, editor. Glencoe, Illinois: The Free Press of Glencoe, 1962. Pp. 272. $7.50.

Organizing for Defense: The American Military Establishment in the Twentieth Century. By PAUL Y. HAMMOND. Princeton, New Jersey: Princeton University Press, 1961. Pp. 403. $8.50.

One of the more significant and encouraging developments of the period since World War II has been the appearance of a body of scholarly literature dealing with all aspects of military activity, a field formerly reserved for a small number of experts, usually in uniform. Reflecting a concern with the problems of war and peace in the nuclear age, this literature represents the work of a group of civilians, mostly historians and social scientists, who by applying the techniques and methods of their own disciplines to the great issues of our time have sought to arrive at a better understanding of these issues and thereby hopefully contribute to their solution. With the passage of time, their work has become increasingly mature and sophisticated, and has had an impact far wider than most scholarly writing, both on the policy level where one can, for example, trace changes in organization, strategic concepts and budgeting in the Defense Department to the writings of such men as Henry Kissinger, Charles Hitch, and Paul Nitze, and in the broadened public discussion of an area of public concern once considered the exclusive concern of the military.

The maturity and importance of this type of scholarly writing is evident in three recent books, which constitute a significant addition to this body of literature. All three share a negative quality, i.e., they do *not* deal, as does so much of the recent work on the military aspects of national security policy, with the substantive issues of policy that loom so large today. What they are concerned with are the institutional mechanisms created to deal with these issues, the process by which these issues are decided and policies made, and, finally, the environment within which these processes take place. They deal with underlying and basic questions that affect and help to shape policy on the day-to-day matters with which policy makers customarily deal. In this sense, they represent a more valid area of scholarly inquiry and perhaps a more enduring contribution than those works that seek solutions to immediate issues by supporting, opposing, or offering alternatives to specific policies and programs. This is not to say that scholars and scientists should not take a position on policy questions, or that they cannot contribute much to the resolution of such questions, but only to suggest that when they assume such a role they are acting as publicists, advocates, and policy makers rather than as scholars or scientists.

The author and editor of two of the volumes, Samuel P. Huntington, is well known to students of military affairs. In *The Soldier and the State*, published by the Belknap Press of Harvard in 1957, he presented an original and highly provocative study of the theory and politics of civil military relations that opened up fresh vistas in an overworked field that was much discussed but little understood. Since then, as associate professor in the Department of Government and Public Law and associate director of the Institute of War and Peace Studies at Columbia University, he has continued to work in the military field. The results of this work are set forth in two volumes published within the last few months, one of which he wrote and the other he edited. The first, *The Common Defense: Strategic Programs in National Politics*, deals with military policy between 1945 and 1960 in terms of politics and decision-making. The second, *Changing Patterns of Military Politics*, is a collection of essays dealing with the role of force in society under the changed conditions created by the cold war and military technology.

The theme of *The Common Defense* is clear from the subtitle. What Huntington attempts to do is describe the policy process as it relates to strategic programs, i.e., the size of the military effort, force levels, and weapons, in the same way that any political scientist would describe the process by which government policy, whether it be foreign, fiscal, or agricultural, is made. He views military policy during these years of rapid change from various perspectives and seeks to derive generalizations concerning the formation of such policy. Throughout he stresses the dual character of military policy, reflecting as it does the domestic and international goals of the nation. "If this book has any distinctive message," he writes, "it is that military policy can only be understood as the responses of the government to conflicting pressures from its foreign and domestic involvements."

Though the focus of *The Common Defense* is on the policy process rather than on policy, it nevertheless deals at some length with specific policies. Nor could it be otherwise. It is hardly possible to explain the way in which strategic programs were shaped and adopted without consideration of the strategies they were designed to implement. Thus the reader will find much in the book that is of value in understanding the various strategies proposed since 1945. There is a valuable chapter, for example, on "The Search for a Stable Deterrent" which describes the evolution of the deterrent strategy from 1945 through the Truman and Eisenhower administrations; and another on "Innovations of Strategic Programs" that deals not only with deterrence but with European defense, continental defense, and limited war.

Professor Huntington has an exceptional ability to get at the heart of a problem. He is a keen and perceptive observer, skillful in marshaling his evidence, and bold in drawing significant conclusions. One may frequently disagree, but his generalizations are invariably useful in dealing with disparate and sometimes conflicting data. Facts long known and almost trite take on new meaning as he uses them to support his analysis. His analogy of policy making within the executive branch with the legislative process (Chapter III) is an example. So also is his analysis of interservice competition (Chapter VI) and his characterization of this rivalry as castellation, i.e., the construction by each of the services of institutional and political defenses resembling the elaborate fortifications of medieval castles.

Changing Patterns of Military Politics also deals with the political process, but it is the politics of the military as a class with which it is concerned rather than the politics and processes that produce the military policy of a nation. Moreover, *Changing Patterns* has a broader canvas than *The Common Defense;* it deals with foreign as well as American military groups, and ranges from new forms of warfare to the lobbying activities of the National Guard. Finally, like most symposiums, it consists of divergent essays of varying quality, having, as the editor says, "neither common subject nor common method."

Yet the essays have a common theme—the impact of the technological revolution in weaponry and the cold war on military concepts and forces. Some of the essays describe the effects of these changes; others seek to formulate generalizations applicable to these and other developments. Among the latter are those by Huntington and Harold D. Laswell. Professor Huntington deals with two major types of internal conflict, revolutionary war and coups d'etat, both very different from the traditional use of violence between states. In view of the nuclear stalemate and the increasing resort to force to resolve internal ideological differences and bring about political and social change, the necessity for understanding this type of war is more important than ever. Huntington's analysis is particularly timely and points the way to further research in this area. Harold Laswell uses the occasion to reexamine the garrison state hypothesis he first formulated almost a quarter of a century ago, and finds no reason to discard it. Rather he believes that, unfortunately, his hypothesis still provides "a probable image of the past and and future of our epoch."

It is neither possible nor necessary to describe in detail all seven essays in this stimulating volume. Among the more interesting is Laurence Radway's study of the NATO Defense College as an example of military behavior in an international organization; Raoul Girardet's analysis of the crisis in civil military relations in France, a case study that holds important lessons for those concerned with the political role of the military in the United States; and Martha Derthick's excellent study of the National Guard as a military lobby. Not least among the contributions of this volume is the thirty-page critical bibliography of military writing, the best this reviewer has seen to date.

Military policy, Huntington remarks at one point, can be roughly divided into strategy and structure—a useful distinction that has been employed with profit by others. Huntington himself deals with strategy, and more particularly, strategic programs. Structure, which relates to organization, manpower, budgets, supply, etc., he treats only cursorily. Fortunately, the first of these has been dealt with most satisfactorily in *Organizing for Defense: The American Military Establishment in the Twentieth Century,* by Paul Y. Hammond, of the political science department at Yale.

Professor Hammond's study has the large merit of a longer historical perspective than Huntington's work. It was as a result of the war with Spain at the turn of the century that the United States first adopted the general staff system, and Hammond quite properly begins his study at this point. Thus, the first half of the book deals with the period down to 1945. In these chapters Hammond traces the development of institutions and doctrines devised to meet the organizational problems of modern war: the general staff system of the Army, the Navy's bureau system, the place of air power within each of the services, and the mechanism of interservice planning that began with the establishment of the Joint Board in 1903 and led ultimately to the Joint Chiefs of Staff. Most attention is given to the general staff system, and its eventual triumph is attributed to the alliance between the Secretary of War and Chief of Staff against internal attacks from the powerful bureau chiefs and external attacks from Congress. The World War II period is covered in some detail, with separate chapters on the War Department, the Navy Department, and the Joint Chiefs of Staff. This period saw the spectacular rise of air power to virtual autonomy and the development of the JCS system, based partially on the earlier Joint Board model and partially on the British Chiefs of Staff.

The second half of the volume deals with developments since World War II and is focused largely on the continuing process of unification. Starting with the drive for unification which began early in the war, Hammond describes the controversy over unification, the eventual passage of the National Security Act of 1947, and the various reorganizations of the Department of Defense since. He leaves little doubt that major forces are tending toward increased centralization of control in the hands of the Secretary of Defense, and in his final chapter considers various proposals for improving the existing organization, though he himself offers no solutions. His treatment throughout is critical rather than descriptive, the historical narrative providing the framework for analysis in terms of organizational theory and practice.

Central to Hammond's discussion of organization is the question of civilian control. How does one achieve the efficiency and economy required in modern war without jeopardizing civilian control of a far-flung and highly complex military establishment? Too much control may be as dangerous as too little. Where should one draw the line? And what provisions must be made to assure proper coordination between the political and military agencies of the government? These are the major questions that had to be answered in each reorganization of the military high command since 1900, and these are the questions that Hammond deals with in his discussion of the general staff, the Joint Chiefs of Staff, and the secretaries of the military departments.

These three books, then, provide a comprehensive and informed description of the way the U.S. military establishment is organized, how it operates in its relationship to other agencies and branches of the government, the pressures on it from within and without, the role it plays in the formulation of policies, and the way in which it exercises control over the execution of these policies as they apply to the military. These books are not easy reading, and the reader will find much in them that he cannot accept. And this reviewer would like to register a personal but probably vain protest again the practice of placing footnotes at the back of a chapter or book. But taken together, the three volumes add much to our understanding of the military as a class and as an institution. One would need only to add a comparable study on the economic aspects of national security to round out a small library on the strategy and structure of the military establishment in the United States today.

Louis Morton

Toward World Rule of Law

Symposium on Next Steps in Extending the Rule of Law. *Notre Dame Lawyer*, Vol. 37, No. 1, 1961. $1.50.

Hundreds of normally tough-minded, no-nonsense American lawyers are today excitedly working toward a vague and undefined goal—the rule of law. The vigor that such lawyers habitually display in the solution of mundane problems of private clients is not missing in this more selfless endeavor. Articles on the rule of law crowd the pages of professional legal journals. Committees are formed. Huge sums of money are raised. Ambitious conferences are commonplace. In this year alone conferences were organized by Americans in such distant places as Tokyo, San Jose, and Lagos, Nigeria. There has even been a World Rule of Law Center established at Duke University.

The basic idea behind the concept of the rule of law is that law, rather than force or arbitrary action, should govern the settlement of disputes. But as should not be surprising, there is not complete agreement concerning content. Some enthusiasts emphasize the development of more stringent rules of international law to control arbitrary action by nations and of more effective tribunals to enforce those rules. Others concentrate on the establishment of independent judiciaries and on protection against arbitrary action by government in new and developing nations. A leading institution of the latter type is the International Commission of Jurists, a nongovernmental organization of lawyers and jurists from a number of countries with a secretariat in Geneva headed by Sir Leslie Munro, former president of the United Nations General Assembly.

Illustrative of activities emphasizing the former, or international law, approach to the rule of law was a Symposium on Next Steps in Extending the Rule of Law held at Notre Dame in April, 1961. The five papers there presented, on the whole interesting and competent pieces of work by leading lawyers and political scientists, reflect some of the uncertainties concerning the content of the rule of law.

In the first paper Wallace McClure argues that, contrary to presently accepted U.S. constitutional principles, treaties should be superior in domestic courts to all acts of Congress. In particular, he would reject the presently accepted rule that a subsequent act of Congress which is clearly inconsistent with a prior treaty, while not relieving the United States of its international obligation, nevertheless supersedes that treaty as domestic U.S. law.

Arthur N. Holcombe stresses the need for improved law-making machinery at the international level. Criticizing the present reliance on inefficient multilateral negotiations at *ad hoc* international conferences, Holcombe suggests that greater use should be made of the procedure of amendment of the United Nations Charter. Through the two-thirds ratification procedure, the new agreements could be made binding on dissenting members. Moreover, a more convenient forum for negotiation would be continuously available. Holcombe further envisions, in that distant day when the cold war has disappeared, the growth of the United Nations into a bicameral legislature with the General Assembly and the Security Council as the two houses.

Stanley D. Metzger, more interested in what is possible in the present state of world affairs, emphasizes that no nation will agree in advance to submit its conduct to external legal control except within narrow, specifically defined limits. He therefore suggests working out the world's problems through cooperative action within existing institutions.

The remaining papers, provided by Charles S. Rhyne and Louis H. Mayo, are particularly interesting insofar as they reflect divergent approaches in the rule of law movement. Rhyne isolates as a dominant element of the present inefficiency of international legal controls an uninformed world public opinion and, in good American fashion, suggests organizational solutions such as an international institute on the rule of law, and a world law year, patterned on the International Geophysical Year. Mayo, on the contrary, largely ignores the rule of law and focuses on the increasing complexity of decision-making. To Mayo the prime barrier to the attainment of world law and order is the complicating effect of growing technology and industrialization on problems facing public officials.

The Mayo position contains much wisdom. The problems of the cold war are largely political, not legal. Even domestically we normally work out political problems through political processes, not in the courts. Law will not soon replace diplomacy in international affairs.

The rule of law movement is useful insofar as it counters forces of isolation, particularly within the legal profession. Through this movement we may be able to take small, concrete steps toward more effective international legal controls. One such step might be the abolition of the Connally Reservation which now permits the United States to be its own judge on certain questions involving the jurisdiction of the International Court of Justice. If the movement leads us, however, to ignore the political nature of our problems and to believe in simple solutions, it will be a disservice and a source of future disillusion.

KENNETH W. DAM

The Irreversible Decision, 1939–1950. By ROBERT C. BATCHELDER. Boston: Houghton Mifflin Company, 1962. $5.00.

Immediately after the bombing of Hiroshima and Nagasaki a few churchmen raised their voices to decry the use of atomic bombs, but opinion was by no means unanimous; the Pope did not condemn the bombing, and some church spokesmen condoned it on the grounds that it had saved lives. Ethical judgment at that time was passed under the shock of the suddenly apprehended atomic destructiveness, without full knowledge of the facts. Now, almost seventeen years later, Robert Batchelder, who holds a B.A. in mathematics and a PhD in Christian social ethics (and has been a pastor), re-examines the moral question dispassionately, in the light of the ethical principles operating in wartime. His book is a lucid and detailed historical analysis of the steps that led to the decision to use the bomb and of the alternatives to each step taken. It interprets the thinking behind the actions of scientists and policy makers, and illustrates the stand of the Christian churches.

After the deep self-criticism to which atomic scientists have accustomed us, Dr. Batchelder's book comes almost as a surprise. For, though he clearly would like to condemn the use of the bomb, he cannot do so by rigidly applying Christian moral codes, modified as they were by the necessities of war. The churches have always accepted the doctrine of the just war and are not against war *per se* or the means of waging war. In the case of the atomic bomb, the moralist has two fundamental approaches to choose from in rendering judgment. One, which Dr. Batchelder calls utilitarian, or calculative, considers and evaluates the consequences: since the bomb cut short the war and saved lives, the decision to use it was the choice of the lesser evil. The second approach is formalistic and considers the act in itself: being a direct attack on civilian population, use of the bomb was forbidden by moral standards. A fire raid, however, or a mass bombing, is morally equivalent to the use of the bomb, and fire raids and mass bombings did not arouse any true opposition from the churches. A fire raid on Hiroshima, which the churches would probably have not condemned, would not have brought the war to an end. "Although in one dimension (that of form) the two raids are morally equivalent, in another dimension (that of consequences) one is much better than the other . . . certainly it was better on moral grounds that the killing and the disruption of Japanese civil life should stop than it should continue." Thus Dr. Batchelder reluctantly accepts the atomic bomb in the historical context of its use.

The dilemma of the inherent immorality of nuclear weapons and the statesmen's responsibility to defend their nation has not been solved by existing ethical codes, and Dr. Batchelder closes his book with a plea for a new ethic. "The development of such an ethic for the nuclear age is surely one of the most urgent tasks confronting both moralists and statesmen today."

Dr. Batchelder has painstakingly examined historical sources, and his book reveals the serious deficiency in the literature. Most of the books on the history of the Manhattan Project, though good in many respects, are either inaccurate and somewhat biased, like Jungk's *Brighter than a Thousand Suns,* or present too personal a view, like Compton's *Atomic Quest,* or were never meant for reference, like this reviewer's *Atoms in the Family.* Sixteen years after its publication, H. D. Smyth's very technical *Atomic Energy for Military Purposes* is still the only entirely reliable book on this subject.

Publication of two more books has just been announced: General Leslie R. Groves, *Now It Can Be Told,* a personal story of the Manhattan Project reflecting the military point of view; and Richard G. Hewlett and Oscar E. Anderson, *The New World 1939–1946.* This last is the first volume of the official history of the AEC, and fills many gaps in the previous accounts of the uranium project.

LAURA FERMI

The Price of Liberty. By ALAN BARTH. New York: The Viking Press, 1961. Pp. 193. $4.50.

Alan Barth's writing reflects a persistent concern with the problems of order and liberty. After two critical and eloquent books during the McCarthy decade, *The Loyalty of Free Men* and *Government by Investigation,* which dealt with issues generated by the excitement over domestic Communism—issues that were in a legal no man's land, in this book he shifts focus to Anglo-American criminal procedure. This time he has moved to the very stronghold of legal norms—the constitutional rules of procedural due process in criminal cases, and he comes not to criticize but to praise and to inform the public of its heritage. Although his training is that of a journalist, he has executed admirably the exacting task of discussing a complex body of law, never losing his main theme in detail and never slipping into technical error. And he has brought to his task two special strengths, an effective and lucid style, and a contagious enthusiasm for the values the law here embodies.

The book deals essentially with three topics. The first four chapters cover the limitations on the power of the police to detain and arrest and to exact confessions. The next three chapters explore the limitations on the power of the police to collect evidence and deal with searches and seizures and wire tapping. A third unit discusses the obligation of the state to provide legal counsel for the indigent criminal defendant. A final chapter handles more broadly problems of punishment and rehabilitation.

He has thus selected some central aspects of the due process ideal which illustrate both the policy of reducing the risks of convicting the innocent and the more elusive policy of reducing the risks of invading privacy. One cannot but wish, however, that he had chosen to give his essay greater centrality by drawing a wider net so as to have included such additional aspects of procedural decency as the right to trial by jury, the right to a public and prompt trial, the prohibitions against double jeopardy, against vague and uncertain definitions of crime, and against retroactivity, and finally the most perplexing liberty, the privilege against self-incrimination.

The contrasts between this book and his two earlier essays point to a fascinating but difficult issue with which he does not attempt to wrestle in the current book. The issue is why our society is so decent and patient when pursuing the criminal with the full power of the criminal law and so much given to excess and impatience when pursuing subversives with the noncriminal sanctions of loyalty oaths, congressional investigations, deportation proceedings, and loyalty security hearings. Perhaps someday Mr. Barth will give us an essay exploring this ambivalence toward procedural decencies. In the meantime we are grateful for the present volume.

HARRY KALVEN, JR.

Science and the Nation. By J. STEFAN DUPRE and SANFORD A. LAKOFF. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962. Pp. 185. $1.95.

No student of contemporary government can disregard the effect of science and technical innovation on public policy. The big decisions we make in foreign policy are those approved or found necessary by at least one body of scientific opinion. One need only cite President Kennedy's decision to resume nuclear testing in the atmosphere to illustrate this point. Thanks to Sir Charles Snow, we have been made acutely aware of the relationship between science and government and how it may fix our destiny. But what are the practical aspects of this relationship today in the United States?

J. Stefan Dupre and Sanford A. Lakoff, assistant professors of government at Harvard have written a coherent, straightforward account of the rising dependence of government on science and technology since World War I. Most of their basic material is drawn from Congressional hearings and government agency reports. It is not particularly well exploited, however. Some of the scandalous, intriguing, and even hilarious disclosures in these documents which might have brought the book to life are left out.

It seems to me the authors do not explore as fully as Congress did the implications of the contracting out system. This is the device by which the armed services and some agencies buy civilian brains and talent to compete with each other, at appalling cost and waste of time. One result of contracting out has been to defer reform in the federal civil service. Many good scientists have found the system much too rigid to tolerate. By contracting out for their services, the military and civil agencies simply bypass the civil service problem and thus cut off pressure to solve it.

Dupre and Lakoff draw a clear picture of government's dependence on science. But they do not consider in any detail the other side of the coin, the dependence of science and the scientist on government. This is the aspect of the relationship that should alarm the scholar. Insofar as research and development are financed by taxes, the politician has a measure of control, not merely over the research but over the research man as well. If anyone wonders how far this has gone let him try to interview for publication a scientist in a federal laboratory or office without a monitor being present. The monitor is a federal press agent and he may terminate the interview if he feels it is going against the interests of the agency or the agency boss.

One cannot forget that the interaction of science and government cuts both ways. Dupre and Lakoff have given us a scholarly account of its effect on government. Its effect on science and the scientist bear further illumination.

RICHARD LEWIS

Population Perspectives. By PHILIP M. HAUSER. New Brunswick, New Jersey: Rutgers University Press, 1960. Pp. 183. $3.50.

A concise summary of the data about population increase, first with reference to the entire world and then with reference to the United States. The consequences and implications of the present rate of growth are clearly set forth. Hauser believes that the present rate of population increase cannot long continue without jeopardizing world peace and the welfare of all mankind. A sound national policy requires prompt measures.

Letters to the Editor

Civil Defense

I wonder what Mr. Piel meant to accomplish by his attack on civil defense. At a time when people have begun to want shelters from fear of the consequences of nuclear bombing, does he really believe he can scare them into not wanting them? When he quotes "one set of calculations" (sic) as predicting that "a 1000-megaton (sic) bomb . . . could set six of America's western states afire," does he really believe this suffices to make us accept his conclusion: "It may be that the effects of the firestorms are, literally, unthinkable?" Did it not occur to him that instead of making his readers stop thinking, he might have stirred them into asking who the unnamed calculator was, whether he checked it and found it valid, whether firestorms can develop at all outside of heavily built-up areas, and what the chances are of surviving firestorms in shelters supplied with oxygen tanks. . . .

Neither our alliances, our bases, our planes, nor our missiles have given us absolute security. Why demand that civil defense do the impossible? The test of a shelter system should not be whether it guarantees to save all the people under all imaginable circumstances, but whether it promises to save a great many people under the most probable circumstances. Mr. Piel has not proved that such protection is unobtainable; in fact, he has not even tried to do so. He has not touched upon the crucial technical issues. Instead, he has tried to overawe us with the enormity of the problem as a whole, with its frightening aspects, its difficulties and uncertainties. He does not argue the infeasibility of nuclear defense—he implies it.

All of Mr. Piel's technical statements are wide open to technical counterarguments. But he would never accept a decision on technical grounds. In the end, it turns out that for Mr. Piel the pros and cons of civil defense add up to mere shadowboxing. For he regards the federal civil defense program as a step in the "escalation of violence." While civil defense was made to appear infeasible a moment ago, it now encourages our statesmen "to take larger risks," and "it invites a preemptive strike." Obviously, the same objections could be raised against any measure designed to strengthen our defensive or retaliatory power. We must conclude, therefore, that what Mr. Piel really wanted to say was, "Let us drop out of the arms race." I submit that it would have been better had Mr. Piel frankly said so instead of disguising his thoughts as an attack against civil defense. If he had chosen that broader framework, it would hardly have been possible for him to ignore his obligation to explain why we need not fear that the policy he recommends would not result in a lessening of that "iron compulsion" by which "both sides are driven to the conference table"—the absence of such an explanation being the most conspicuous shortcoming of Mr. Piel's article.

WALTER W. MARSEILLE
Berkeley, California

In response to Gerard Piel's article "The Illusion of Civil Defense," I agree with him. Nuclear war is unthinkable, it would be catastrophic. God-fearing people cannot even countenance the thought. But, I ask him, and the countless others like him that are spreading the gospel of "bend our time, money and energies toward peace," how do you propose to make your theories work? Don't tell me that good begets good and evil begets evil; this is fine for rational civilized people, but detail for me how unilateral disarmament (and we did it) helped deter Hitler, Mussolini and Tojo from their collection of inhumanities leading up to World War II. Detail for me, if you can, how 100 per cent dedication to peace, without adequate defense, deterred Red China from raping Tibet. Explain how Goa slipped on preventing Nehru from aggression.

The plain, hard, cold fact remains that a Godless regime is not morally bounded. As Stalin once remarked: "How many divisions does the Pope have?" The only thing we have to judge the communists and dictators by is past action. The present road to United States peril is strewn with good intentions and strict compliance with our sacred word on our part and with deceit, duplicity and double-dealing on the communists' part. Have Mr. Piel explain for us how he would trust Khrushchev and Mao Tse-tung or even how he would get Khrushchev and Mao Tse-tung to trust each other!

I say, let us try any and all manner of honorable means to insure peace. But, while we are doing it we must remain so strong that no doubt remains in anyone's mind of our capability to survive. The oft-proposed argument that civil defense will convince Khrushchev that we are bent on war is poppy-cock. Khrushchev is only interested in one thing: can he win. Or can Mr. Piel prove otherwise?

As for fostering a war acceptance among the U.S. population, what is Mr. Piel's alternative? Acceptance of the communist dictum that eventually they will take us over? To use the oft-quoted cliche, this sounds like "better red than dead." My God, where would we be now if the pioners had rejected the doctrine of self-defense? For that matter if we had tried to do business with Hitler? There comes a time when to turn the other cheek means give an inch and they will take a mile. I, for one, would be willing to "give another inch" if Mr. Piel can show me conclusively that the Reds will not take another mile, but not until. In the meantime our very survival dictates we must maintain our defensive posture, both military and civil defense.

C. A. Favill
San Diego, California

I have been following the shelter debate with much interest and have collected and analyzed the information and arguments available. I must commend and heartily endorse the shelter statement of the Federation of American Scientists that appeared in your February issue as being one of the most intelligent, objective, and rational expositions so far to appear on this complex and controversial topic. I must also state my objection to the position of Mr. Piel and the signers of the open letter in two important respects.

First, their arguments are against the possibility, probability, or feasibility of thermonuclear war and not against the effectiveness of shelters. Sixteen years ago scientists may have proved war obsolete but unfortunately not to the Soviet or Chinese governments. Another point stressed by both Mr. Piel and the open letter is the magnitude of post-attack problems and again is not directed at the shelter question. In fact, post-attack problems would exist with or without shelters; the only difference is there would probably be less people around to face them.

Second, they libel and insult the intelligence and morale of the American people and our government when they imply that the existence of shelters increases in any significant way the probability of thermonuclear war. All *official* publications and responsible studies of the problem have painted a somber picture of mass destruction and loss of life regardless of the attack pattern hypothesized or the existence of the most ambitious civil defense program. As for shelters provoking an attack, surely hardening of our missile bases and construction of additional Polaris submarines is infinitely more provocative. With the current balance of power we would certainly have to threaten the USSR with more than a modest civil defense program to push them to risk thermonuclear catastrophe.

Mr. Piel is correct when he says fallout is one thing we can worry about—and do something about. It is not our only worry certainly, but that should not prevent us from taking prudent effective action in an area where this is possible. Problems of counter economy attacks, thermal attacks and post attack recovery also need much consideration; and this has correctly been pointed out, but denying the possibility of their solution and therefore their occurrence is not constructive, realistic, or germane to the specific question of the fallout shelter.

George Cunningham, M.D.
Oakland, California

Hiroshima

Mr. John J. Robinson's review of Robert Jungk's *Children of the Ashes* (February Bulletin) characterizes Mr. Jungk as "militantly humanistic" and his novel as "dominated by emotional bias." He deplores Mr. Jungk's "failure" to achieve "the insight of Tolstoy, who comprehended the anatomy of war and peace." This the present writer finds an amazing statement: is the reviewer certain that Tolstoy, living today and confronting Hiroshima and Nagasaki, would not be militantly humanistic?

Decidedly we need more and more humaneness, not less. We should be grateful that an increasing number of dedicated scientists are becoming socially responsible, pleading with genuine emotion that we employ reason *and* loving kindness in order to outlaw and prevent such war crimes in the future.

Jungk, says Mr. Robinson, "seems unaware of that universality of suffering whereby disease, death, and disintegration are the fate of all component things in unending change." A neat paraphrase: however, it was not nature that perpetrated disaster upon those non-military cities. It was our calculated and meaningless cruelty and it now calls for atonement.

As for reports given by laymen who have visited Hiroshima hospitals and the pitiful victims still existing in huts along the river, their reports seem incredibly unemotional considering the suffering witnessed.

In short, the reviewer surveys "the anatomy of war" from a much too lofty mist-enshrouded eminence. We need to be objective, get down to earth, and abolish war.

Ingerard Uppman
Menlo Park, California

For years I have grown accustomed to reading the Bulletin of the Atomic Scientists with admiration and gratitude for the enlightenment it always has brought, but a book review in your February issue is so unlike your consistently human attitude that I must protest.

I had finished reading *Children of the Ashes* only a few days before reading the review of it in your magazine which was written by one of the doctors with the Atomic Bomb Casualty Commission in Hiroshima whose work is devastatingly described in the book. It is deplorable that Dr. Robinson, instead of acknowledging the cold-heartedness masquerading as scientific objectivity in which the Commission was conceived and operated, insists on trying to rationalize the cruelty of our conduct.

The reviewer's concluding paragraph, contrasting the book's call for a fight to preserve life against the destruction of nuclear war with the Buddhist view that life is a gift of grace, shows how confused his mind is. Certainly life is a gift of grace as it comes from the Creator, but it does not follow that we should therefore accept destruction from the hand of man.

Alice Cooper
Limona, Florida

News and Reports

Tristram Coffin Comments

WASHINGTON—On a misty, sweet day of Indian summer 17 years ago, in a small and crowded room of the old Senate Office Building, there began a struggle. American science moved to block the military from continuing its wartime control of the atom.

The military, through big, bulky, red faced Rep. Andrew May—who later became involved in a scandal over military contracts—supported a bill to give the armed services virtual decisive control. Weeks of testimony, debate, and cloakroom dealing produced instead the McMahon Bill with an Atomic Energy Commission, a civilian body, and a Joint Atomic Energy Committee of Congress, whose job in effect was to make sure the executive did not turn over control to the military.

What has happened in the tragic years between that autumn and today? Brien McMahon is dead. The military thrust its foot in the door of the original commission when President Truman, at the urging of Defense Secretary James Forrestal, named Lewis Strauss to the AEC. During the Eisenhower Administration, the AEC did little more than second Pentagon decisions. The original Commission made a searching inquiry through the General Advisory Committee, on the hydrogen bomb dilemma, and then made recommendations to the President. Mr. Kennedy in his public statement on renewed tests did not indicate that the views of the AEC or the scientific community had been solicited.

The Joint Committee, which has become institutionalized with a very elegant suite of offices does not have a science advisory committee, nor did it make any effort to find out from a broad section of competent scientists their views on the value of testing. Yet its members constituted the most potent political unit demanding tests. The chairman, Rep. Chet Holifield, was heard again and again insisting that the United States constantly test new nuclear weapons. It was Holifield who, when confronted with earnest young students petitioning for an end to tests, barked, "You're full of baloney." Senator John Pastore, a high ranking member of the Joint Committee, refused to see the students, according to their reports. (The President arranged for his top aides, McGeorge Bundy and Theodore Sorensen, to talk to a delegation of the student peace marchers.) Rep. Melvin Price, another member, grumbled mightily because Dr. Hans Bethe in a lecture to Cornell students minimized the military necessity of testing. The Joint Committee held no hearings after the Soviet monster tests on the advisability of renewed western testing. In fact, it might be argued that the Joint Committee today is little more than a Congressional megaphone for military thinking on nuclear matters, and has less objectivity than the Senate Armed Services Committee, which, having been in the game longer, is not quite so awed at the sight of brass buttons. (Senator Clinton Anderson, former chairman of the Joint Committee, is an exception. He is willing, no, insistent that the administration provide more information to the public on nuclear problems. He might arrive, as he did, at the same conclusion as Holifield, only after closer consideration.)

The Joint Committee merely reflects Congress as a whole. As Joseph Alsop pointed out in a recent column, military contracts have become the prize patronage. Thousands of jobs are involved in each award and Congressmen scramble about to the Pentagon's favor. There is also an inherent fear in most Congressmen that a vote or a statement against a military position somehow connotes lack of patriotism and will be so construed by the opposition. The Republican leadership team early saw this implication, and prodded the administration for months to resume testing. So far as I can tell, only two members of the House, and no Senators, even suggested that the President may decide not to test.

Also, Congress, and particularly the House, maintains a smug "know-nothing" mood on science. The hearing of the House Science and Astronautics Committee with Colonel Glenn and his mates was a lesson in political buffoonery. The witnesses were striking in their poise and dignity in face of sometime absurd questionings by the Representatives.

The American politician has a built-in resistance to and resentment of science and logic. They are alien to him. The President's science advisor, even under Mr. Eisenhower, was regarded with suspicion on Capitol Hill, and the House Un-American Activities Committee keeps a sharp, squinted eye on the utterances of scientists. Dr. Oppenheimer was treated as a common criminal, with no outcries of protest from Capitol Hill.

Three years ago, a try was made to bring Congressmen face to face with some of the best minds of the academic community. This was the Liberal Project. It never enlisted more than 12 Representatives out of a total of 435. When in the 1960 elections five members of the Project were defeated, the Project fell apart. Rank and file Congressmen were more than ever convinced that knowledge was subversive and politically dangerous.

This is not unique in the political affairs of man, as a study of Socrates, Galileo, and Bertrand Russell would show. But what is startling is that the American political system has produced so few men with a keen interest in science, or even a tolerance for its views.

Most of the leaders of Congress are older men whose hearts and minds do not belong to the urban, mechanical, test tube twentieth century, but in the rather simple life of American small towns at the turn of the century. Senator Robert Kerr, chairman of the Senate Space Committee, boasts that he was born in a log cabin in Indian Territory, went to a tiny Baptist college where Darwin was regarded as a rank heretic and the creation of the universe as satisfactorily explained in Genesis. He proudly insists that God's country extends no further than the borders of Oklahoma, and his interest with it. Congressman Holifield was born in a town of southeast Kentucky, raised in Arkansas, and operates a clothing store in Montebello, California. The chairman of the Senate Appropriations Committee is an 85 year old ex-sheriff of Maricopa County, Arizona, and his opposite in the House was born in 1879 and represents a rural area of Missouri.

Young men actually interested in the complex, changing society find it difficult to break into politics and make their way to Congress. The cost of running against opposition is rarely less than $10,000 and may run as high as half a million dollars in a highly urban district where television is used. One political manager told me frankly, "You can't run for Congress on a shoestring any more. This is a thing of the past. It's almost essential to have a big wad of money. The Democrats can't guarantee this money, and have trouble recruiting candidates for Congress. The young men who don't have to worry about financial and press support are those who pledge their hearts in advance to right wing policies. Too, since elections in many districts are decided by a narrow margin, no candidate likes to disturb any minority thinking. Thus, no Congressman is likely to arise and demand that foreign aid or welfare programs teach birth control. Yet quite obviously a drop in the birth rate in India or among welfare clients in Washington, D.C. would be immensely beneficial.

Once in Congress, the Representative is likely to hear the wisdom of the late Speaker Rayburn, who said, "The way to get along is go along." To be more specific, the way to stay in office is to take care of errands for the home folks (folks is a word used almost entirely by politicians and Arthur Godfrey), mail out seed catalogs, and say nothing controversial.

All this tends to slow down the wheels of progress on Capitol Hill, so that today Congress is the most stick-in-the-mud of the three branches of Government. Congress would never in a hundred years go as far as the Supreme Court decision on school segregation. Congress, if left to its own devices, would not pass medical care to the aged or federal aid to schools; it would, instead, tend to concentrate on passing out the pap in the pork barrel, private bills, resolutions denouncing Castro, and staging spectacular investigations.

Serious, thoughtful statements on the major issues of the times are so infrequent that reporters, not used to this kind of thing, pass them by and run for the best seats at the rackets hearing. In the Senate, Fulbright, Eugene McCarthy, and Mike Mansfield show a rare creativity and intellectual honesty. The House is far more barren, with only a few newcomers, as Robert Kastenmeier, offering fresh ideas.

If science wishes to have any influence on the direction in which the United States is going and not merely serve as a captive to make better weapons or computers, it must make itself more acceptable to the whole American community. Scientists at the Massachusetts Institute of Technology and Harvard must speak not only to their students, but to the working men of Cambridge. Students roused by Hans Bethe or Leo Szilard must do more than carry signs in front of the White House. They must talk to their friends and neighbors in Muncie and write letters to their local newspapers.

New Scientific Consultant Policy

On February 9, President Kennedy issued a memorandum to all government agencies containing standards of conduct for scientific consultants. The memorandum is designed to insure scientists' compliance with the conflict of interest statutes, and requires scientific (and other) advisors to keep the government informed about private financial interests. Consultants are specifically enjoined from using inside information to advance private interests.

The reasons for issuing the memorandum include the dilemma which has arisen since scientists have been needed increasingly for consultation by the government, on the one hand; while on the other, they have been increasingly supported in their research by government financing. More directly, there have been recent charges that some scientific consultants have used their positions, and their advance information, for their own profit, or for the profit of corporations which employ them in order to gain the benefits of their inside information. The conflict of interest laws are a hodge-podge dating from the Civil War era, and do not provide a clear policy guide for present needs.

The Presidential memorandum aims at clearing up interpretations of the statutes. The six basic conflict of interest laws pertinent for scientists are sections 281, 283, 434 and 1914 of Title 18 of the U.S. Code (which prohibit some activities for government employees); section 284 of Title 18, and section 99 of Title 5 (which prohibit some activities for a two year period following termination of government service). These statutes, Kennedy's memorandum says, "are fully applicable to an individual who serves or has served the government as an advisor or consultant, whether with or without compensation."

The first of the statutes, section 281, prohibits an "officer or employee of the U.S." from receiving compensation for services rendered in relation to "any matter in which the U.S. is a party or directly or indirectly interested." Effectively, this prohibits consultants from acting on the behalf of nongovernment employers, such as universities or corporations, in most important matters that come before the government.

An opinion from the Attorney General's office, included in the memorandum, concludes that section 281 applies to "intermittent" consultants and advisors only on the days when they are actually consulting for the government, and to "certain consultants and advisors on days during the period of their availability for government service when not so employed." If actual consulting occupies "a substantial portion" of the period of availability, or affords "principal means of livelihood," intermittent consultants and advisors are subject to section 281 during the entire period they are available.

The President suggests that consultant and advisory appointments be made only to "the end of the current fiscal year," and that if a consultant is to be employed at least 40 per cent of the time, he be regarded as a government employee for the entire period; hence, subject to section 281. Otherwise, consultants are subject only on days of actual employment.

The President makes it clear that section 281 aims at preventing "the sale of influence to gain special favors for private business, and the misuse of government position or information," and points out that an advisor should "make every effort to avoid any personal contact with respect to negotiations for contracts or grants with the department or agency he is advising" during the times he is not subject to the prohibitions of the statute.

An important change in interpretation suggested in the memorandum is an extension of Title 18, section 434, "beyond its literal language" for consultants and advisors. Unmodified, section 434 reads: "Whoever, being an officer, agent, member of, or directly or indirectly interested in the pecuniary profits or contracts of any corporation . . . or other business entity, is employed or acts as an officer or agent of the U.S. for the transaction of business with such a business entity, shall be fined not more than $2000 or imprisoned not more than two years, or both."

The extension proposed by President Kennedy excludes an advisor both from performing duties involving such businesses and from "rendering of advice which will have a direct and predictable effect upon the interests of a business entity," in which he has financial interest. "A nonprofit organization or educational institution" is defined as a business entity. Consultants are particularly enjoined from "evaluation of contract or grant proposals which will directly affect the interests of such a business entity." Exceptions can be made by department or agency heads if "such participation is, on the particular facts, consistent with the interests of the government."

Title 18, section 1914, was previously so vague that it was virtually never enforced for consultants. It prohibited government employees from receiving outside compensation "in connection with" their government service. This is now said to apply to all except consultants for short periods, who may continue to receive their regular salary from nongovernmental employers for as much as 30 days of their government service. For longer periods, each case will be decided on its merits.

A section on ethical standards of conduct is included in the memorandum—the first time such standards have been set for consultants. Dealing with inside information, abuse of office, and acceptance of gifts, this section's contents are enforced by no legal sanctions, and simply suggest that if an advisor or consultant is not explicitly under the jurisdiction of one of the statutes, that "does not relieve him from the obligation to abide by these rules."

Several steps are outlined for putting the conflict of interest statutes into better shape. Agencies are advised to avoid employing advisors "who are employed or consulted by contractors or others having a substantial amount of business with that department," but it is noted that if experts in an area are few, some overlapping may be necessary. If university scientists advise on grants to universities, "particular care should be exercised to exclude his employer's or client's contracts . . . from the range of the consultant's or advisor's duties."

To avoid violations of the statutes, a disclosure of financial interests will be required of consultants and advisors from now on. An advisor must name companies, research organizations, and educational institutions he serves as employee, officer, member, director, or consultant, and stocks and securities with "significant financial value."

Several problems remain unsolved as yet. There is much that is vague about the statutes, even with the modifications in interpretation suggested by the President. Many sections will have to await a precedent-establishing trial case before intepretations are clear. Moreover, despite careful attempts to avoid the possibility, it is clear that if some of the modified statutes—in particular, section 434 under the modified interpretation of the memorandum —were strictly enforced, they would bar the most competent scientists (who are most in demand for consulting with industry, as well as with the government) from aiding the government in formulation of scientific and technical decisions.

Discussion of the memorandum with lawyers has raised another residual question a court case might solve: Has the President the right to make what amounts to amendments of laws? It is not clear whether or not the memorandum is a source of law; for this reason all of the President's new stipulations might be challenged if cases are brought to trial. However, the President's memorandum may serve as a stop-gap, clarifying the confusing conflict of interest laws until the confusion is eliminated by Congressional action.

If strictly enforced in present form, even under President Kennedy's interpretation, the conflict of interest statutes might be harmful to the country's interests; if loosely enforced, they might be useless. The Atomic Energy Commission "solved" its conflict of interest dilemma by ruling in January that scientists on its General Advisory Committee cannot act as private consultants to *any* private concern doing work sponsored by the commission. This position had been adopted in 1959, but was not strongly enforced until an advisory ruling from the Justice Department confirmed that such a ruling is in accord with the law. The AEC's position is much stricter than Kennedy's memorandum suggests the government to be contemplating as a general policy for its science advisors. One Defense Department official is reported to have said: "Under the commission interpretation, we would be denuded of all our scientific consultants."

On February 26, President Kennedy ordered federal advisory committees to require stricter control of content, conduct, and records of their meetings; to tighten procedures for avoiding conflicts of interest among committee members; and to extend coverage of the conflict of interest statutes to committees not now under their regulation. Advisory committees may not be formed without authorizing legislation; they may do nothing but advise (decisions on advice, unless authorized by law are to be made by government officials); meetings must be called and agendas approved by government officials, who must also preside at meetings; accurate minutes must be taken; and, at meetings made up primarily of representatives of a single industry or group of related industries, verbatim transcripts must be taken. —PF

Space Cooperation

To a considerable degree, the U.S. and USSR space programs are complementary. The Soviet Union, with its well-developed rocket technology, has rockets with greater lifting capacity, and perhaps greater reliability. But it has launched few satellites, and has accumulated relatively little data on scientific and technical uses of satellites. The U.S., on the other hand, has made many launches with its less powerful rockets, and has recorded much scientific data, as well as developing sophisticated, miniaturized instrumentation. For technical benefits, if for no other reason, cooperation in space programs would be desirable.

On March 7, President Kennedy proposed to Premier Khrushchev a five-point program of space cooperation. His letter, made public on March 18, was the third in a recent series of exchanges on Soviet-American space cooperation. Khrushchev had proposed cooperation in a letter congratulating Kennedy for the orbital flight of John Glenn (See April NEWS, and Editorial). Kennedy's specific proposals were quite similar to those proposed at the seventh COSWA conference of scientists held at Stowe, Vermont, last September. In the official statement, the COSWA participants proposed: 1) An exchange of scientific information in areas "Such as physics and the effects of space environment on life," together with periodic symposia on such subjects. 2) Information exchanges on instruments and methods of conducting studies having "no military importance." 3) Assignment within two years of space radio frequencies. 4) Bilateral agreement on tracking stations. 5) An agreement on coordinated space activities during the International Year of the Quiet Sun. 6) Cooperation in use of rockets for the projected world magnetic survey, including satellites launched into different orbits by different nations. 7) Cooperation in setting up, or studying the feasibility of, international communications and weather satellite networks. 8) Cooperation in studying the moon, and extension of the principles of the Antarctic treaty to cosmic bodies. 9) An international symposium to discuss ways to avoid biological and radiological contamination of cosmic bodies.

Kennedy asked that the Russians consider: 1) Joint establishment of a weather forecasting satellite system, with the U.S. and USSR each launching a satellite in polar orbit, in planes perpendicular to each other. 2) A jointly operated radio tracking network, with one station in the U.S., one in the USSR, each operated by technicians from the country of the station's location. Equipment for the U.S. station would be supplied by the USSR, and vice-versa; and each country would train the other's technicians to operate the equipment it had supplied, thus effecting an exchange of information on instrumentation techniques. Each country would afford the other "such access as may be necessary to accommodate modifications and maintenance of equipment." 3) To determine the exact nature of the earth's magnetic field, each country would launch a satellite (one in near earth orbit, one more distant), and provide data to the world scientific community. 4) The Soviet Union could cooperate in building equipment and conducting tests for a worldwide communications satellite network. 5) The U.S. and USSR could pool efforts and exchange knowledge in the field of space medicine.

Beyond the five specific points, Kennedy pointed out that the costs and risks of extensive space exploration suggest the advisability of pooling these efforts: "Leaders of the U.S. space program have developed detailed plans for an orderly sequence of manned and unmanned flights for exploration of space and the planets. Out of discussion of these plans and your own . . . would undoubtedly emerge possibilities for substantive scientific and technical cooperation in manned and unmanned space investigations. . . . We might cooperate in unmanned exploration of the lunar surface, or . . . definition of steps to be taken in sequence for an exhaustive scientific exploration of the planets Mars and Venus. . . . We might share responsibility for the necessary projects."

Kennedy also urged that the U.S. and USSR recognize the contributions "other states the world over might be able to make in such programs," and report on any agreements for cooperation to the U.N. Committee on the Peaceful Uses of Outer Space." He suggested further that U.N. committee delegates, (who met in New York for the committee's first meeting since its reorganization), meet with technical representatives Kennedy has delegated to discuss the program.

On March 21, Khrushchev replied to Kennedy's letter, saying that the "huge dimensions of the problem [of space exploration] demand an extensive pooling of scientific, technical, and material opportunities and resources by states." He listed six areas where the Russians would be willing to cooperate:

1) Cooperative exploration of "the possibilities for the solution of the problem" of communications satellite networks. 2) Weather forecasting satellite systems. 3) Joint observation of the solar system's planets, and joint astrophysical and celestial mechanics studies. 4) Negotiating an agreement "providing assistance for the search for and rescue of spaceships, sputniks, and capsules that descend to the earth by accident." 5) Cooperative study of the earth's magnetic field, and an exchange of data on space medicine. 6) An attempt "to find a common approach to the settlement of important legal problems that life itself sets before the states in the space age." Khrushchev praised the initial principles of space legislation agreed upon by the U.N., and suggested that further steps were in order, especially an agreement that "experiments in outer space, which may render difficult the exploration of outer space by other countries should be the subject of preliminary discussion and agreement on a proper international basis." This was probably a reference to the forthcoming second U.S. attempt to launch a packet of three million needle-like orbiting dipoles.

Khrushchev pointed out that any space cooperation program "depends to some extent on the settlement of the disarmament problem. Prior to achievement of an agreement on general and complete disarmament, both our countries would still be limited in their possibilities to cooperate in the field of outer space," since "military missiles and space ships which are launched for peaceful purposes are based on the same achievements of science and technology."

At a press conference on March 21, President Kennedy said he was "gratified that there are a number of areas of common interest," and that the U.S. was "deeply committed" to space cooperation. On March 24, speaking at the University of California at Berkeley, he said:

"Experience has taught us that an agreement to negotiate does not always lead to negotiated agreements. But should such a joint effort be realized, its significance could well be tremendous. But the scientific gains a joint effort would offer might be small compared to the gains for world peace. For a cooperative Soviet-American effort in space science and exploration would emphasize the interests that unite us, instead of the conflicts that divide us."

He continued: "As men conduct the pursuit of knowledge, they create a world which freely unites national diversity and international partnership. This emerging world is incompatible with the communist conception of world order. It will irresistibly burst the bonds of communist organization and communist ideology."

The President authorized Hugh L. Dryden, deputy administrator of the National Aeronautics and Space Administration, to meet with Anatoly A. Blagonravov, a member of the Soviet Academy of Sciences and former COSWA conference participant, and discuss space cooperation. The talks were expected to deal with technical objectives, and it was hoped that both technical and political considerations could be settled within the framework of the U.N. Committee on the Peaceful Uses of Outer Space, with such subsidiaries as the World Meteorological Organization, and the International Telecommunications Union.

Initial discussions will probably cover relatively modest proposals. One U.S. official said that they would try to avoid projects involving "flying my satellite on your booster, or witnessing each other's launchings." The inspection issue may arise in connection with a cooperative space program; in addition, there is the problem of assuring reciprocal information exchanges. Soviet U.N. delegate Platon Morozov told the U.N. that the Soviet Union would "on the basis of mutuality" explain the purpose of each launching. The U.S., which has been liberal in releasing much space information, has classified all details about its Samos "spy in the sky" satellite (see December, 1961, NEWS), and is classifying, over the protests of scientists, project Anna, a satellite program to improve measurement of the distances between points on earth.

—PF

B-70 in Congress

The potential future of the multimillion dollar B-70 bomber is still in some doubt. Defense Secretary Robert S. McNamara has contended that the B-70, as a bomber, will be outmoded by missile developments by the time it can be produced (first models are scheduled for production in 1967). The original Air Force proposal for a fleet of 140 B-70 bombers McNamara claims, would cost $10 billion. He proposes that three prototype planes be built and tested, at a cost of $1.3 billion.

The Air Force has suggested that the craft be re-named "RS-70" (for "reconnaissance and strike"). Air Force chief of staff Curtis LeMay said: "With a missile alone, you're never going to know the results of your attack unless you go and look." He says that the 2000-mile-an-hour plane, which would fly at "more than" five miles altitude, could dash over enemy territory to make sure missiles struck their targets. It could use "air to ground" missiles to finish the task. (At present, there are no such missiles in production; the Army's Skybolt, which might fill the bill, is still undergoing research and development.) McNamara said March 15, in a long statement defending his position on the RS-70, that its use as a reconnaissance and strike force involves many unsolved problems, some of them "may well lie beyond what can be done on the basis of present scientific knowledge." He characterized the plane as "no more than a manned missile," with "important disadvantages when compared with ballistic missiles." Used for reconnaissance and strike, it is "poorly designed," and presents "difficult technical problems," which make it "very far from being ready for production or even full weapon system development.

The Air Force has modified its position, now calling for a force of 50 such planes, at a cost of $5 billion. The present controversy centers around how much should be spent for immediate development of prototypes, as well as the question of whether Congress has the power to decide defense policies by mandating spending. At hearings before the House Armed Services Committee, Secretary McNamara asserted that most of this extra spending would not speed eventual production of the bomber (or reconnaissance plane) but would merely duplicate research and development programs already being conducted.

Chairman of the committee, Carl Vinson (D, Ga.), exerting the committee's constitutional authority, sent to Congress a resolution which, if it had been passed, would "direct, order, mandate, and require" the Department of Defense to spend the extra $310 million next year. The last three administrations have refused to spend military appropriations beyond requests.

On March 21, Congress passed a bill authorizing $13 billion for procurement of missiles, planes, and ships, which included $491 million for the RS-70. Original language in the bill which ordered that all the money appropriated for the RS-70 be spent, was dropped after President Kennedy wrote to Vinson saying that he would insist on his constitutional right as Commander in Chief to have final say on directing military spending. Kennedy continued that McNamara had shown "his willingness to re-examine the RS-70 program." In a separate letter to Vinson, McNamara said that a new study of the RS-70 was being initiated, and "if technical developments advance more rapidly than we anticipated, we will wish to take advantage . . . by increasing our development expenditure."

Several issues raised by the controversy were discussed editorially in leading newspapers. The *New York Times* commented that the "constitutional issues (the division of powers over the military between executive and legislative branches of government) obscured the technical issues. The editorial suggested that McNamara remember, "no one can foresee the full nature of technological change, and that we must be cautious in discarding the tested old (the piloted bomber) for the untried new weapons of tomorrow."

The *Christian Science Monitor*, on the other hand, considered secrecy the most important issue of all—secret selection and rejection of weapons and weapons systems. They asked, "who wants to take the responsibility for saying no to a weapon that might save the country—who will risk being wrong in so vital a matter?" Concluded the *Monitor*, "This is the supreme test of management in the technical age and Mr. McNamara has at least changed the climate from pessimism to possibility."

The *Washington Post* editors believe that Congress would be "well-advised to leave the constitutional and jurisdictional issues to the slow evolutionary process" and examine the RS-70 in the light of national defense. "Such a reexamination could logically involve the question of how much thermonuclear overkill we must have and how long we must go on multiplying it after we have acquired the capability of destroying the enemy many times over."

Atomic Power

In its annual report covering 1961 operations the Atomic Energy Commission summarized 1961 progress in power reactors: "Operating activities were encouraging, while construction activities were discouraging." It appears that this trend will continue into 1962. The construction of a 50,000 kilowatt atomic power plant, authorized by Congress in 1959, with the understanding that if private companies did not build it, the AEC would, has been deferred indefinitely. One reason for the deferment is technical problems (fuel element fouling by decomposed organic coolant); another is probably the budget squeeze the AEC has felt this year.

In 1961, Shippingport (Pennsylvania), Yankee (Rowe, Mass.), and Dresden (Illinois) nuclear power stations were regarded as most satisfactory. But six plants which had been scheduled to begin operations in 1961 were delayed because of construction delays and technical difficulties. Five other scheduled power projects were cancelled or deferred. The Experimental Boiling Water Reactor (EBR), the first U.S. atomic power plant on a large scale, at Argonne National Laboratory, Illinois, will be closed down by the end of June. Its original design was for 20,000 thermal kilowatts, and 5000 electrical watts. It operated below capacity, supplying only the power demands of the Argonne Laboratory. Major improvements were recently completed, which boosted the plant's capacity to 100,000 thermal kilowatts. Improvements cost several million dollars.

Project Gnome, the AEC's underground peaceful nuclear explosion, is a failure as a source of heat to generate electric power. There was enough heat in the cavity to produce steam, but January drilling showed that the pressures were too small for power production, probably because of the same leak that caused a small radioactive cloud to escape at the time of the explosion, in December.

Nine nuclear power plants, private or AEC-sponsored, are under construction, or in the final stages of planning. The new plants will have a combined generating capacity of 630,000 kilowatts.

On March 19, President Kennedy directed the AEC to take a "new and hard look" at nuclear power needs, and the future commercial role of nuclear power. Members of the Joint Congressional Committee on Atomic Energy began hearings on the growth and state of the atomic industry on March 20. Committee members criticized this directive on the eve of the hearings, apparently in an effort to blunt criticism of the administration's role in the atomic power program. There was criticism anyway. Committee chairman Chet Holifield (D, California) called it "pitifully inadequate," and other Democrats joined the attack.

Soviet Science

The Soviet Academy of Sciences met in Moscow November 15 and 16 to discuss the 22nd Party Congress. Academy president M. V. Keldysh reported that as early as March 26, 1959, Molotov had been removed from from his position of honorary academician, and Dimitri Shepilov from his position as corresponding member. He also discussed in detail the scientific councils under the State Committee of the Council of Ministers on Coordination of Scientific Research. The councils are to direct the development of 27 research problems of highest priority; 12 councils are to be headed by academy members.

Keldysh reported that since the formation of the state research coordination committee in May, 1961, about one-half the research institutes of the academy and one-third of its scientific workers have been transferred from the academy to appropriate ministries; among those transferred were: mining, metallurgy, energetics, electromechanics, forestry, forest chemistry, and soil science. The academy retains scientific leadership of the transferred institutes most closely connected with science, such as the institutes of automation and telemechanics, acoustics, precision mechanics, computer technology, minerology, geochemistry, and crystal chemistry. Keldysh pointed out that some of these institutes have achieved important scientific discoveries, such as the basic development of fast-working electronic machinery, improvement of soil productivity, and classification in mapping. He hoped that transfer of the institutes would raise the scientific level of work in corresponding industrial departments.

Keldysh also opposed the suggestion that after the transfer the division of technical sciences in the academy be closed, saying that the division retains an important role in establishing close relations between science and new technology. The institutes of mechanics, radio and technology, electronics, automation and telemechanics, and the laboratory of information transfer systems were said to remain in the academy's technical sciences division, despite earlier mention of automation and telemechanics as being moved from academy control. He suggested creating an institute of heat physics, and hoped that this and the other remaining technical institutes of the academy would become great scientific centers. Academy divisions of earth sciences, and economics have been suggested, Keldysh said, but the academy is not ready for a decision on establishing them.

Keldysh's speech creates the impression that conscious planning of scientific research and its relation to the practical problems of the national economy are to be strengthened by the new system of scientific councils. It remains to be seen whether this new drive to organize science will result in more change in the spontaneous and chaotic progress of science than previous directives of the same sort.

The list of doctoral degrees conferred in 1960 for work in different institutes of the academy casts an interesting sidelight on cultural relations between the USSR and China. In the Soviet Union, doctoral degrees are not granted at the end of study courses at the university, but are given later, in recognition of independent scientific work.

In the physical sciences and mathematics, 36 doctorates out of 250 were granted to Chinese scholars. In geological sciences, 3 out of 40; in biological sciences, 7 out of 120; in technical sciences, 27 out of 150; in historical sciences, none out of 50; in economic, philosophical and legal sciences, none out of 50; in literature and languages, none out of 25. It will be interesting to see if the disagreements between the USSR and China will affect the number of Chinese science and technology students in the USSR for 1961 and for the coming years.

Keldysh's report was complemented by a report by academy vice-president A. V. Topchiev on the personnel of the academy, and measures for academy rejuvenation and growth. He deplored the fact that, at present, 80 per cent of the young scientific workers accepted for work in academy institutes come from only two universities, Moscow and Leningrad, and hoped that other universities would soon be contributing more workers.

—ER

Sweden's Reactor

Sweden gained considerable experience in designing and manufacturing complicated power reactors while building the Ångestad combined power and heating reactor outside Stockholm. This reactor will begin operating early in 1963, providing both electricity and byproduct steam heat for some 50,000 apartments in Stockholm. The Swedish Atomic Energy Board feels that, from a manufacturing point of view, it is impossible to move directly from this 65 megawatt unit to a full-scale power plant producing 300 to 500 megawatts of electric power, and has suggested as an intermediate step a 105 megawatt power plant at Marviken.

The board feels that commercial power reactors will probably become not only feasible but necessary in Sweden by 1970 or 1975. Since at the current rise in power consumption (6.5 per cent a year), all exploitable hydropower resources will probably have been harnessed by the 1970s, and thermal power stations burning imported oil would strain the country's balance of trade, atomic power will have to be introduced on a large scale sometime after 1970.

The board has urged that the nuclear reactor development program be kept to earlier aims of local design and manufacture of reactors adapted to Sweden's requirements, and has recommended $30 million in state appropriations for nuclear energy in 1962–63.

Names in the News

Frederick Seitz, head of the University of Illinois department of physics, is chairman of the recently-established, 12-member Presidential committee to consider recommendations for the National Medal of Science. The award, established in 1959 by ex-President Eisenhower, but never presented, will go to as many as 20 scientists a year.

Pierre Chatenet, former French Interior Minister, has succeeded **Etienne Hirsch** as head of Euratom. Reportedly, the French government decided against backing Hirsch because of de Gaulle's hostility to "supranationalistic tendencies" of Euratom. France has opposed Euratom programs outside the field of basic research as detrimental to her own atomic progress.

Authors

Bentley Glass ("Scientists in Politics," page 2) is a geneticist and member of the department of biology at Johns Hopkins University. He served on the committee of the National Academy of Sciences that prepared the American report on "The Biological Effects of Atomic Radiation" in 1957. A frequent contributor to the BULLETIN, he was guest editor of the symposium on biological and chemical warfare (June, 1960, BULLETIN).

Steven R. Rivkin ("The Hobbled Weapon," page 8) is a consultant to the White House Office of the Science Advisor. When he wrote this article he was executive secretary of the Joint Arms Control Seminar of Harvard University and the Massachusetts Institute of Technology.

P. M. S. Blackett ("The University's Mission," page 14), professor of physics at the Imperial College in London and president of the British Association for the Advancement of Science, has written extensively on the role of science in developing nations. His present article grew out of the Irvine Memorial Lecture given late last year at St. Andrews University, Scotland.

Peter A. Moldauer ("Population Survival," page 19) is a nuclear physicist in the reactor engineering division of Argonne National Laboratory. His article is an outgrowth of a smaller study he did on what nuclear attack would mean to Naperville, Illinois, where he lives.

Donald N. Michael ("Psychopathology of Nuclear War," page 28) is Director of Planning and Programs of the Peace Research Institute in Washington. He has been consultant to the Federal Civil Defense Administration and the National Research Council Committee on Disaster Studies.

Leopold Infeld ("Freedom for Science," page 31) is professor of electrodynamic and relativity theory at the University of Warsaw. A former collaborator of Albert Einstein, he is one of the creators of nonlinear electrodynamics, and has written numerous books in the field.

Gerd Burkhardt ("Disarmament in Middle Europe," page 32) is professor of technical physics at the School of Technology in Hannover, Germany, and co-editor of *Atomzeitalter,* a monthly German magazine.

Louis Morton (book review, "For the Military Bookshelf," page 36) is a member of the Department of History at Dartmouth College.

Kenneth W. Dam (book review, "Toward World Rule of Law," page 38) is associate professor in the Law School of the University of Chicago.

Laura Fermi (review of *The Irreversible Decision,* page 38) is the author of *Atoms in the Family* (University of Chicago Press, 1954), the story of her life with Enrico Fermi, and *Mussolini* (University of Chicago Press, 1962).

Harry Kalven, Jr. (review of *The Price of Liberty,* page 39) is professor of law at the University of Chicago, and a frequent contributor to the BULLETIN.

Richard Lewis (review of *Science and the Nation,* page 39) is the science writer for the *Chicago Sun-Times.*

Tristram Coffin ("Tristram Coffin Comments," page 42), Washington correspondent for newspapers, magazines, and radio, again contributes a letter from the capitol city.

Timothy Leary, George Litwin, Michael Hollingshead, Gunther Weil, and **Richard Alpert** ("The Politics of the Nervous System," page 26) are affiliated with the Center for Research in Personality of Harvard University.

THE CASE AGAINST CIVIL DEFENSE

by Sidney Lens

AT LAST! THE TRUTH ABOUT CIVIL DEFENSE

A 30,000 word sourcebook of facts and brilliant interpretation that together make a compelling presentation of "The Case Against Civil Defense." It's yours **FREE** with a trial subscription to The Progressive at half the regular price.

Get your copy now of the most authentic, the most complete analysis of civil defense and fallout shelters ever published—thoroughly documented.

This special issue of The Progressive goes right to the heart of every facet of civil defense. It provides the information you need to expose the shelter folly. It is yours free with an introductory subscription that saves you 50% over the newsstand price.

Enclosed $2. Send The Progressive for seven months, plus a free copy of "The Case Against Civil Defense" to:

Name ....

Address ....

....

THE

PROGRESSIVE

408 W. Gorham St. Madison, Wisconsin

FREE

with a special trial subscription to The Progressive

7 months for only $2

(a half price offer)

A firsthand probe into
"Islam" in the U.S.

BLACK NATIONALISM:

A SEARCH FOR IDENTITY IN AMERICA

By E. U. Essien-Udom. An African assesses the Muslim movement in America and the nature of its appeal to the lower class urban Negro. Writing from direct acquaintance with the Chicago leader Elijah Muhammad and many of his followers, he discusses the activities of the movement and analyzes its social, psychological, and political implications. *Illustrated.* $6.95

Time for a major strategic
revision of NATO?

NATO: THE ENTANGLING ALLIANCE

By Robert Endicott Osgood. "What is the place of NATO within the over-all military strategy of the United States? What functions could NATO perform for the European communities and for a more closely integrated Atlantic community? What impact is the impending diffusion of nuclear weapons likely to have? ... It is the great merit of Professor Osgood's book that he raises these questions and tries to answer them ... he reasons as the political and military statesmen ought to reason."
—HANS J. MORGENTHAU. $7.50

THE COLLECTED PAPERS OF ENRICO FERMI

Vol. I: Italy, 1921-38
The definitive edition of the papers of the "architect of the atomic age" up to his departure from Italy.
Coming June 26. $15.00

STIPENDS AND SPOUSES

By James A. Davis and others. The results of the first national study of arts and science graduate students and their financial problems.
$5.00

UNIVERSITY OF Chicago PRESS

5750 Ellis Avenue
Chicago 37, Illinois
IN CANADA: The University of Toronto Press, Toronto 5, Ontario